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# USSR Report

CHEMISTRY

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AEROSOLS

UDC 54-138:541.182.021

DETERMINATION OF DISTRIBUTION FUNCTIONS ACCORDING TO PARTICLE SIZES IN  
AEROSOLS FROM MEASUREMENTS MADE ON DIFFUSION BATTERIES

Moscow KOLLOIDNYY ZHURNAL in Russian Vol 48, No 1, Jan-Feb 86 (manuscript  
received 25 Jun 84) pp 108-113

[Article by A.Yu. Pusep and N.V. Shokhirev, Institute of Chemical Kinetics and  
Combustion, Siberian Department, USSR Academy of Sciences, Novosibirsk]

[Abstract] Diffusion methods are used in studies of highly dispersed aerosols. An experiment with netlike diffusion batteries was used to solve the restoration of distribution function by particle size; the passage of aerosols through these batteries was measured and analyzed using Tikhonov's regulation method. A concept of an "interval of reliable restoration" was introduced and recommended for the use as an interval of definition for the solution of the reverse problem. The analysis performed showed how it is possible to determine the range of aerosol particle sizes in which the distribution function could be solved reliably. The reported examples demonstrated the potential for restoration of the distribution function without assumption of concrete functional relationships. Figures 4; references 9: 3 Russian, 6 Western.

7813/13046  
CSO: 1841/479

## ADSORPTION

UDC 541.18

### COLLOID CHEMISTRY AND SCIENTIFIC AND TECHNOLOGICAL PROGRESS

Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 1, Jan 86 pp 47-58

[Abstract] A report was presented at the Scientific Council of the USSR Academy of Sciences by Academician I.V. Petryanov-Sokolov, Chairman of the Scientific Council on Colloid Chemistry and Physicochemical Mechanics. Petryanov-Sokolov noted the change that has occurred in colloid chemistry in the last decade and its transformation into a science dealing with dispersion phases and surface phenomena. A summary was presented on current research topics at the various Soviet research establishments, with the notation that more than 220 organizations are currently involved in colloid research. Among the academic institutions involved are the Institute of Physical Chemistry, USSR Academy of Sciences (AS), the Institute of Colloid Chemistry and Water Chemistry imeni A.V. Dumanskiy, Ukrainian SSR AS, Institute of Inorganic Chemistry, Siberian Department, USSR AS, Institute of Chemistry, Uzbek SSR AS, the Peat Institute and the Institute of General and Inorganic Chemistry, Belorussian SSR AS, Institute of Chemistry, Estonian SSR AS, and the Physicochemical Institute imeni L.Ya. Karpov, USSR Ministry of Chemical Industry. Special attention was accorded to the extensive studies on surfactants and their practical applications. In conclusion, a resolution passed by the Presidium of the USSR AS noted that practical application of advances in colloid and surfactant science lags behind set goals.

12172/13046  
CSO: 1841/418

UDC 539.2

### ADSORPTIVE-DESORPTIVE PROCESSES ON SOLID BODY SURFACES

Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 12, Dec 85 pp 17-29

[Article by V.N. Ageyev and E.Ya. Zandberg, doctors of physicomathematical sciences]

[Abstract] New approaches have been developed at the Laboratory of Physical Electronics of the Physicotechnical Institute imeni A.F. Ioffe, USSR Academy of Sciences, to study and define adsorptive-desorptive phenomena on solid

surfaces. The two fundamentally-most-useful techniques are thermodesorptive spectrometry and surface ionization. Both methods are complementary, with the former providing valuable information at relatively low temperatures, and the latter technique, at relative high temperatures. Detailed theoretical discussions are presented of both methods, with the notation that surface ionization has been applied to the detection and studies of the neutral component of electron-stimulated desorption. Several academicians commented on the value of these techniques and noted the need for their immediate application in industrial establishments.

12172/13046  
CSO: 1841/418

UDC 541.183

SPECIFIC MODIFICATION BY ALKALI METALS OF ADSORPTIVE CHARACTERISTICS OF  
TITANIUM AND ZIRCONIUM PHOSPHATES FOR AMMONIA AND WATER VAPOR

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 60, No 1, Jan 86 (manuscript received 12 Dec 84) pp 230-232

[Article by V.N. Belyakov, V.V. Strelko, A.I. Bortun, A.A. Popov and T.M. Polekhova, Institute of General and Inorganic Chemistry, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] An analysis was conducted on the adsorptive consequences of introducing alkali metals (Na, K, Li) into titanium (TP) and zirconium phosphates (ZP) on their adsorption of  $H_2O$  and  $NH_3$ . Evaluation of the adsorption isotherms demonstrated that, for example, while ZP preferentially adsorbs  $H_2O$ , Li-ZP adsorbs  $H_2O$  and  $NH_3$  to an essentially equivalent extent. Synthesis of ZP in the presence of K ions led to the development of an adsorbent--K-ZP--that showed preferential adsorption for  $NH_3$ . Analogous findings pertained to TP and TP-based adsorbents modified with the alkali metals. These observations show that modification of TP and ZP with alkali metal ions can be used for the design of adsorbents with selective affinity, especially for water and ammonia, based on the creation of ion exchange sites with geometric dimensions corresponding to the adsorbed molecules. Figures 3; references 6 (Russian).

12172/13046  
CSO: 1841/412



## INTERACTION IN CARBON-ORGANIC BINDER SYSTEM

Moscow KOLLOIDNYY ZHURNAL in Russian Vol 48, No 1, Jan-Feb 86 (manuscript received 25 May 84) pp 96-102

[Article by V.S. Ostrovskiy, N.A. Lapina and N.S. Starichenko, Scientific Research Institute of Graphite, Moscow]

[Abstract] The strength of solids formed from powders depends on the number and strength of the contacts formed. An attempt was made to establish the rules of wetting, adhesion, and baking and their relationship to the binder composition and structural characteristics of carbon materials. Thermodynamic work of the adhesion of coal pitch was determined ( $73-99 \text{ mJ/m}^2$ ) along with its intervals of changes expressed as a function of initial properties of the pitch. Porosity of a carbon substrate diminished its wetting with pitch. The strongest adhesion was obtained with homogeneous structure of carbon substrate and pitch with the highest values of thermodynamic adhesion work. Strength changes were determined for adhesive contact in the system carbon substrate-pitch during heating to temperatures corresponding to basic thermodynamic reactions in pitch. Figures 5; references 4: 3 Russian, 1 Western.

7813/13046

CSO: 1841/479

## MEMBRANE TECHNOLOGY AND ITS PROSPECTS

Moscow NTR: PROBLEMY I RESHENIYA in Russian 21 Jan-3 Feb 86 pp 4-5

[Abstract] Two full pages of articles by five scientists are devoted to a discussion of the present and future of membrane technology. An editorial preface to the article notes that the 16 inter-industry scientific-technical complexes (MNTK) which were recently created include a complex in this field called "Membrany".

Doctor of Chemical Sciences Yu. Dytnerskiy, head of the chair of processes and apparatuses of the Moscow Chemical Engineering Institute imeni Mendeleev, describes the processes of microfiltration, ultrafiltration and reverse osmosis and their areas of application, and comments on tasks of perfecting membrane technologies.

Corresponding Member of the USSR Academy of Sciences, V. Belyakov, general director of the Research-and-Production Association "Kriogenmash" (cryogenic machinery), discusses membrane technology for separating gases from mixtures. He recalls that in 1976, "Kriogenmash" developed the world's first industrial membrane gas-separation unit, which was intended for obtaining 98-percent-pure hydrogen from a hydrogen-nitrogen mixture. He notes that chemical industry workers are now well familiar with the Association's units which bear the abbreviations MGU, which stands for 'membrane gas-separation unit,' and BARS, which stands for 'automatic environment-regulation unit.' It is said that each BARS can provide an optimally regulated gaseous environment for storage of up to 5,000 tons of fruit.

Doctor of Chemical Sciences K. Dyumachev, deputy chairman of the State Committee for Science and Technology and deputy chairman of the commission on membrane technologies, comments on the MNTK "Membrany". He notes that this complex's head organization is the USSR Ministry of the Chemical Industry.

S. Navashin, member of the USSR Academy of Medical Sciences and director of the All-Union Scientific Research Institute of Antibiotics, discusses the use of membrane technologies in medicine and the medical industry.

V. Rostunov, member of the board of the USSR Ministry of the Chemical Industry and head of its science and technology administration, notes that

his industry is both a producer of membrane materials and a user of membrane technologies. The industry expects to increase production of membrane materials by 10 times during the period 1986-1990. The biggest producer of these materials is said to be the Production Association "TASMA" in Kazan, and its production of membranes for microfiltration is meeting the demand. Rostunov reports that last year in Vladimir, at the All-Union Institute of Synthetic Resins, a test-industrial shop was commissioned for production of membranes and membrane elements for reverse osmosis units. The Research-and-Production Association "Khimvolokno" (chemical fibers) reportedly has begun producing hollow fibers called "Graviton", which are a special type of membrane material.

FTD/SNAP

/13046

CSO: 1841/500

BIOCHEMISTRY

UDC 547.963.4:542.943:546.173

EFFECTS OF INHIBITORS OF RADICAL CHAIN REACTIONS ON OXIDATION KINETICS OF OXYHEMOGLOBIN BY NITRITE ION

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 56, No 1, Jan 86  
(manuscript received 2 Apr 85) pp 188-192

[Article by I.V. Shugaley, N.I. Lopatina, I.V. Tselinskiy and S.L. Panasyuk, Leningrad Pediatric Medical Institute]

[Abstract] Experimental and literature data were combined to ascertain that oxidation of oxyhemoglobin by nitrate ions proceeds according to an ion-radical chain reaction. Evaluation of the kinetics was conducted with and without various inhibitors (hydroquinone, alpha-naphthol, diphenylamine, 4-hydroxy-2,2,6,6-tetramethylpiperidine-1-oxyl). The process of oxidation was confirmed to involve the ion-radical chain reaction mechanism, with formation of the superoxide ion radical generated by electron transfer from the donor nitrite ion to the oxyhemoglobin molecule. Figures 1; references 18: 8 Russian, 10 Western.

12172/13046  
CSO: 1841/449

UDC 547.854+547.857+547.466

SYNTHESIS OF THYMINYLALANINE ANALOGS OF LEUCINE-5-ENKEPHALIN

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 55, No 12, Dec 85  
(manuscript received 14 Feb 85) pp 2787-2788

[Article by O.N. Ryabtseva, G.A. Korshunova and Yu.P. Shvachkin, Moscow State University imeni M.V. Lomonosov]

[Abstract] Previously undescribed analogs of leu-5-enkephalin were synthesized in which the L-phenylalanine residue at position 4 was replaced by L-(beta-(thyminyl-N')-alpha-alanine, as well as containing D-alanine or D-phenylalanine at position 2 in the pentapeptide sequence. The 3+2 scheme of fragment condensation was employed in the synthesis of the analogs, with peptide bond formation effected with the use of pentafluorophenyl esters or the use of the carbodiimide method. Structure of the analogs was confirmed by chromatographic

and spectral studies. Availability of the analogs in question will further studies on structure-activity relationships of leu-5-enkephalin and related neuropeptides. References 3: 1 Russian, 2 Western.

12172/13046

CSO: 1841/414

## CATALYSIS

### MONETARY ADVANTAGES OF ESPECIALLY PURE CHEMICALS

Moscow ZNANIYE-SILA in Russian No 3, Mar 86 p 7

[Text] Progress in the electronic, electrotechnical, radiotechnical, and a number of other fields is already inconceivable without the application of highly pure materials and substances.

A big problem for chemists is obtaining highly pure chemical compounds with the help of reactions in which catalysts are used. Indeed, to separate and then purify products from catalysts is extremely difficult. At the Armenian Branch of the All-Union Scientific-Research Institute of Chemical Reagents and Highly Pure Substances, methods of initiating chemical processes without any catalysts are being developed. One such method is activating the molecule with photocatalysis (exposure to photons). Excitation of molecules of organic substances occurs through resonance: a wave of determined length acts on the "resonating" site or functional group of the molecule. This allows for selective excitation of one or another specific site on the molecule. With such a method, scientists have already learned how to obtain valuable products for flame-resistant polymers, for example.

Another method is magnetic activation of chemical processes. Investigations showed the effectiveness of magnets in activating such reactions as nitrogenation (it is used for producing a number of aromatic nitrogen compounds). As a result, expensive catalysts were saved.

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/13046

CSO: 1841/515-P

EVALUATION OF SILVER CATALYSTS APPLIED TO FAIENCE CARRIER

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 60, No 1, Jan 86  
(manuscript received 5 Mar 84) pp 73-77

[Article by L.A. Manucharova and T.G. Alkhazov, Azerbaijan Institute of  
Petroleum and Chemistry imeni M. Azizbekov, Baku]

[Abstract] IR spectroscopy, x-ray diffraction, and electron microscopy were used to assess the physical characteristics of silver catalysts used in gaseous oxidation of alcohols, employing aluminosilicate FN-441 as the carrier. The samples involved contained 0, 1, 4, or 8 wt% alkali metal (sodium) additive. The combination of IR and x-ray data demonstrated that in all samples silver behaved as a separate, stable phase, and that the phase structure of the catalyst was unaffected by the alkali metal even at a concentration of 8 wt%. In catalysts lacking an additive, the mean particle size of the silver crystals was on the order of 350-400Å, decreasing to an average size of 260 Å in the presence of the additive. The greater dispersal of the silver in the latter case was ascribed to possible interdigitation of the alkali metal ions in the crystalline structure of silver, preventing its crystallization. These findings were in excellent agreement with data obtained with electron microscopy, showing silver particles 450-550 Å in size in catalysts lacking alkali metals, and silver particles sizes of 400-500 Å in samples with the additives. It appears that the selectivity and activity of such catalysts can be regulated through control of silver dispersal. Figures 3; references 9: 8 Russian, 1 Western.

12172/13046  
CSO: 1841/412

## PHASE TRANSITIONS IN FORMATION OF SKELETAL Pd-Zn CATALYSTS BY SURFACE ALLOYING

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 60, No 1, Jan 86  
(manuscript received 26 Feb 84) pp 69-72

[Article by D.V. Sokolskiy, P.I. Zabotin, L.M. Kurashvili, A.Ye. Shalamov, S.V. Druz, A.M. Zagoryev and G.V. Akulova, Institute of Organic Synthesis and Electrochemistry, Kazakh SSR Academy of Sciences, Alma Ata]

[Abstract] Roentgenographic analysis was conducted on Pd-Zn catalysts formed by electrolytic deposition of Zn over a Pd foil to reach a Zn thickness of 40-45  $\mu\text{m}$ . Deposition was conducted for 3 h total, with 5 to 10  $\text{mA}/\text{cm}^2$  currents applied for different lengths of time to assess the effects of such variations on x-ray diffraction. The tabulated data demonstrated that insignificant variations in current in the initial stages had a profound effect on phase transitions in the Pd-Zn catalyst and its electrocatalytic behavior. Potentiometric curves indicated that catalysts with a homogeneous Zn coat contained significantly more hydrogen that was firmly adsorbed to the surface. Essentially complete loss of hydrogen occurred in catalysts with an uneven Zn distribution in the potential interval of 0 to 200 mV. Tabulated data are also provided for the behavior of the different Pd-Zn catalysts in the electrooxidation of hydrazine and electroreduction of hydrogen peroxide. Figures 1; references 12: 11 Russian, 1 Western.

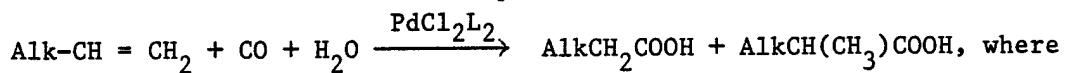
12172/13046  
CSO: 1841/412

## PHOSPHINE LIGAND EFFECTS ON ACTIVITY AND SELECTIVITY OF Pd(II) COMPLEXES IN CATALYSIS OF OLEFIN HYDROCARBOXYLATION

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 57, No 1, Jan 86  
(manuscript received 5 May 85) pp 90-94

[Article by A.V. Protchenko, T.Ye. Kron, A.D. Karpyuk, E.S. Petrov, Ye.N. Tsvetkov and I.P. Beletskaya, Scientific Research Physicochemical Institute imeni L.Ya. Karpov, Moscow; Institute of Physiologically Active Substances, USSR Academy of Sciences, Chernogolovka]

[Abstract] An analysis was conducted on the effects of phosphine ligands on the rate and selectivity of olefin hydrocarboxylation of reactions carried out in an autoclave under 20 atm CO pressure at 20-22°C:



L = ligand  $(\text{PR}_3)_2$ , with R = aryl or alkyl group. GLC analysis of the fatty acid products and their rates of formation in the case of hydrocarboxylation



of 1-heptane in dioxane with excess ligand to prevent catalyst inactivation by Pd-black precipitation demonstrated that selectivity was dependent on both the ligand bulk (conical angle  $\theta$ ) and basicity ( $pK_a$ ). An increase in phosphine basicity in ligands with similar  $\theta$  values diminished the rate of fatty acid synthesis while increasing selectivity. An increase in  $\theta$  values in ligands with similar  $pK_a$  values resulted in diminished selectivity for the linear fatty acid. These observations indicate that both steric and electronic factors control the rate and selectivity of such reactions. Figures 1; references 16: 7 Russian, 9 Western.

12172/13046  
CSO: 1841/449

UDC 66.097.3.002.237

#### UNIVERSAL TECHNOLOGICAL FLOWSHEET AND APPARATUS DESIGN FOR PRODUCTION OF VARIOUS TYPES OF VANADIUM CATALYSTS

Moscow KHIMICHESKAYA PROMYSHLENNOST in Russian No 10, Oct 85 pp 613-616

[Article by V.V. Demin and V.S. Beskov]

[Abstract] A study was conducted on the production of different types of vanadium catalysts in the same apparatus design, with minimal changes in operating parameters. Potassium pyrosulfovanadate in excess potassium pyrosulfate, which is used as the raw material in catalyst production, can be prepared by either the bisulfate or the vanadate method. However, the vanadate method is preferable. Prepared amorphous-silica-based catalysts may require drying and grinding. A boiling-layer dryer and a ball mill were chosen for this purpose. Synthetic carriers are produced by either the hydrosilica gel or the aluminum silica gel process. In all cases, a high-capacity reactor with stirrers and an automatic filter press are required. A vacuum transport system and a two-roller mixer are used to prepare the contact mass, an auger-former to extrude it as granules, a multisection conveyor-type dryer for thermal treatment and a rotary sieve to screen the final catalyst. TS-type catalysts are most economically processed in two parts, carrier and catalyst, while tubular SVS catalyst on silica gel can be produced in one cycle. KS-, SVB-, and SVD-type catalysts can also be prepared using the same apparatus. Figures 2; references 6 (Russian).

12126/13046  
CSO: 1841/228

## OXIDATIVE HETEROGENEOUS CATALYSIS

Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR in Russian No 12, Dec 85  
pp 112-114

[Article by M. Shimanskaya]

[Abstract] An All-Union Seminar on Oxidative Heterogeneous Catalysis was held in Riga on April 15-16, 1985, organized jointly by the Institute of Organic Synthesis of the Latvian SSR Academy of Sciences (AS), the Scientific Council on Catalysis of the USSR AS, and the Latvian Republic Section of the All-Union Chemical Society imeni D.I. Mendeleev. More than 70 representatives from various institutes participated in the Seminar, covering such topics of current interest as the mechanism of interaction of the components of the reaction, selection of multiphase catalysts, reactivity of bound and gaseous oxygen, and the use of mathematical models. Special attention was also accorded to the construction of active sites, the structure of intermediate products, and studies using heteroorganic compounds containing, in addition to oxygen, elements such as phosphorus, silicon, etc. The Seminar was followed by an extended colloquium dedicated to the 25th anniversary of the founding of the Laboratory of Catalytic Synthesis at the Institute of Organic Synthesis. The achievements of the laboratory were summarized in a report presented by M.V. Shimanskaya. Figures 1.

12172/13046  
CSO: 1841/403

COMPLEX SYSTEM OF QUALITY CONTROL OF PRODUCTION AT ANGARSK BVK PLANT (Data Cards 143, 144, 149, 286, 287, 288, 289, 1984, Angarsk BVK Plant)

Moscow MIKROBIOLOGICHESKAYA PROMYSHLENNOST: EKSPRESS-INFORMATSIYA in Russian No 3, Mar 85, pp 1-3

[Text] In 1983-1984, some standards were developed at the Angarsk BVK plant and introduced into a system of quality control of production which has been in operation at the plant for some years while being constantly improved. The system involves all aspects of plant activity, including relationships with suppliers, assessment of quality of raw material and output, personnel training and other matters.

Technical Production Standard [STP] "Sequence of Relationships With Suppliers and Customers. Conclusion and Supervision of the Use of Economic Contracts at the BVK Plant" established a unified sequence of conclusion and use of economic contracts and is disseminated to all departments and plant officials. A contract defines the rights and obligations of parties for delivery of output and implementation of contractual, drawing and design, surveying and scientific research operations and obligations and promotes fulfillment of planned tasks, strengthening of profit and loss accounting and increase of production efficiency. The standard was developed for the purpose of increasing the effectiveness of legal procedures in the production and economic activity of the plant and for amplifying the role of contracts.

STP "Procedure For Providing Raw Material and Auxiliary Materials For the Enterprise" facilitates uninterrupted provision, to the plant, of raw materials and materials required to fulfill the production plan and to meet repair and operational and scientific research needs and is directed at improvement of the department of equipment and supply.

Since one of the most important indicators of operation of the plant is production delivered, there has been worked out a standard which establishes a procedure for preparing documents for certification of industrial production according to categories of quality (higher and first) and which establishes the make-up of the plant certification committee. Certification is used to ensure output of production which meets the highest world standards in technical and economic indicators and which meets the needs of the national economy, the needs of the people and the needs for export. This STP affects operation of all subdivisions of the plant.

In order to ensure metrological quality control of production, there has been developed, at the plant, a standard which establishes basic positions and

requirements for organization and performance of pertinent operations. The STP "Metrological Quality Control of Production" defines a complex of organizational and technical resources which ensure unity and reliability of measurements with required accuracy by ensuring proper working order of measurement devices. This standard applies to operation of the chief mechanic's department, the chief power engineer's department, the control and measuring instruments and automation equipment shop and the engineering shop.

STP "Use of Verification Stamps and Care of Them" establishes requirements for storage, registry and condition of departmental verification stamps and their use. The stamps are used by workers in the department of the chief metrologist who are authorized to carry out departmental checking and are qualified departmental checkers. The stamps are placed only on measurement devices which are to be checked by the department. Individual verification stamps are issued annually to each departmental checker who assumes personal responsibility for the care and operational efficiency of the stamp.

Successful operation of equipment and apparatus determines, in the final analysis, the quality of production, therefore, STP "Procedure For Technical Servicing and Repair of Power Equipment" has been developed and introduced at the plant. It defines basic principles of the work of specialists with consideration of specific features of the plant and establishes the composition of subdivisions participating in electric power supply. The standard defines the subordination and the connection of the plant power services with plant subdivisions dealing with basic problems of power supply and also the interaction of the power service with related organizations dealing with problems of reliability of power supply.

One of the most important problems in the work of the enterprise is the problem of selection, training and placement of personnel. In order to establish rules and norms in the organization of preparation and training of new workers and improvement of skills of those already employed, STP "Training and Advanced Training of Personnel at the Plant and at Branches of the Association" was introduced. The standard defines the required sequence and forms of this work. The standard is obligatory for all sub-divisions of the plant, main specialists and members of certification committees.

2791

CSO: 1841/150

TRENDS OF DEVELOPMENT OF DRUM-TYPE DRIER-GRANULATORS AND PROSPECTS OF THEIR USE IN MICROBIOLOGICAL INDUSTRY. PROCESSES AND EQUIPMENT FOR GRANULATION OF PRODUCTS OF MICROBIOLOGICAL SYSTEMS. (Theses of Papers of All-Union Scientific Conference, Tambov, 1984, pp 34, 35, 36, 53, 58, 78, 87, 112, 113. Tambov Institute of Chemical Machine Construction)

Moscow MIKROBIOLOGICHESKAYA PROMYSHLENNOST: EKSPRESS-INFORMATSIYA in Russian No 3, Mar 85, pp 8-10

[Text] Drum-type devices, thanks to their simplicity and reliability of operation, have been used extensively in many sectors of industry at stages of drying, encapsulation, application of coatings on medicines and granulation. Moscow and Tambov institutes of chemical machinery construction, the Scientific Research Institute of Fertilizers and Insectofungicides and some other institutes are developing these devices and working on methods of their design.

Most promising are devices which make possible mixed processes (drying, granulation, classification etc.). Such devices include the drum granulator-drier (BGS) of several types and sizes, produced in series production. Studies of granulation of bacterial biomass, carried out at the All-Union Scientific Research Institute of Protein Synthesis with use of a BGS device, showed the possibility, in principle, of producing granules from a suspension with concentrations of dry substances of 20 percent. However, a long stay of granules in the apparatus produces qualitative changes of the biomass since products of microbiological synthesis are, as a rule, slightly concentrated suspensions of thermolabile products which require a large amount of heat relative to the low potential for drying and granulation. In order to solve the problem of supplying the amount of heat required, problems associated with the low moisture-penetrability of drum-type devices are being examined.

In the Yaroslavl Polytechnical Institute, there was developed a continuous action coating drum with a helical channel in a spherical cross section with variable geometry of the working surface and methods of its design were worked out. The apparatus contains: a device for loading and unloading the processed materials; coaxially mounted cylindrical drums which have, on the inner surface, spiral guides consisting of shaped, elastic, hollow elements. At the same time, the drums are situated eccentrically and are equipped with individual controls and the elastic, hollow elements are connected to the heat carrier inlet and outlet attachments.

The coating drum design is based on a standard design of drum granulators developed at the Moscow Institute of Chemical Machinery and NIUIF.

Many experimental and theoretical studies of heat and mass exchange and of the hydromechanics of movement of particles in drum-type devices are now being conducted in order to reveal new design solutions. The most promising of these are studies on creation of a thicker and more uniform screen in the zone of its contact with the atomized culture liquid, reduction of time of stay of the product in the apparatus, increase of specific moisture throughput and increase of concentration of the culture liquid being granulated. The All-Union Scientific Institute of Bioengineering, the Moscow Institute of Chemical Machinery and NIUIF have introduced some technical solutions which involve changes of design of the counter screw and the vane attachment, the location and nature of input of the dried product and the heat carrier which makes it possible to avoid contact of the moist particles with the drum packing, to intensify heat exchange and mass exchange and to ensure a uniform flow of material of the qualitative and quantitative composition required in longitudinal and transverse directions in the drum.

2791

CSO: 1841/150

RESPONSIBILITIES OF WORKERS' COLLECTIVES OF CHEMICAL AND PETROLEUM MECHANICAL  
ENGINEERING INDUSTRY IN 12TH FIVE-YEAR PLAN

Moscow KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE in Russian No 1,  
Jan 86 pp 1-3

[Abstract] The various workers' collectives of the chemical and petroleum mechanical engineering industry have responded enthusiastically to the plans proposed by the October 1985 Plenum of the CC CPSU for the advancement of scientific and technological progress and socioeconomic development of the USSR. With the call for increasing the gross national products of the USSR two-fold in the 12th Five-Year Plan and productivity 2.3- to 2.5-fold, the workers of the chemical and petroleum mechanical engineering industry have committed themselves to accelerate the implementation of new technology 1.5- to 2-fold, and to improve the level of automation two-fold. In addition, they have decided to increase machine production by 13%, including a 1.9- to 2.1-fold increase in the output of high-quality products. It has also been resolved that the increase in the requirements for additional fuel and other energy sources will be partially met by greater efficiency in the use of available resources.

12172/13046  
CSO: 1841/419

EXACTINGNESS--IMPORTANT CONDITION FOR SUCCESS IN ECONOMIC MANAGEMENT

Moscow KHIMICHESKAYA PROMYSHLENNOST in Russian No 10, Oct 85 pp 579-582

[Article by V.I. Zaluzhnyy, executive staff secretary, Ministry of Chemical Technology]

[Abstract] In order to fulfill M.S. Gorbachev's requirement for exactingness in the acceleration of scientific and technological progress, a higher level of work performance is required from each manager. In this regard, the initial promise of the new director of large chemical factories with respect to strengthening discipline and increasing worker responsibility has not been fulfilled, and worker dismissal is necessary. Management needs more knowledge and experience in working with people, so that workers and managers will be more demanding of themselves and self-critical. However, the demands

of managers whose only goal is more authority for themselves must be avoided. Workers must be made to realize not only the necessity of fulfilling the plan, but the most effective means for doing so as well. Participation of all members of the collective, rather than imposition of solutions from above, is necessary. Technical managers must keep themselves acquainted with new developments, provide positive and negative feedback to personnel, and encourage work innovations, creativity, and initiative with incentives and training. Permissiveness and tolerance of errors must be avoided. Direct contact with the work force is very important. Dealings with subordinates must be respectful and tailored to individual needs, with attention to working and living conditions. In this way, exactingness in management with a concern for the workers will lead to improved work efficiency. References 2 (Russian).

12126/13046  
CSO: 1841/228

UDC 66.094.524

#### PRODUCTION OF SULFURIC ACID BY NITROUS METHOD AND WAYS TO IMPROVE IT

Moscow KHIMICHESKAYA PROMYSHLENNOST in Russian No 10, Oct 85 pp 600-603

[Article by A.A. Novikov, V.S. Yepifanov, Ye.I. Surkov, S.D. Evenchik, Yu.M. Solovyev, M.V. Lobova, A.P. Gromov and A.Ye. Popov]

[Abstract] The nitrous method for producing sulfuric acid is more economical and has a lower net cost than the contact method. However, the nitrous method cannot produce fuming or high quality acid, and atmospheric contamination is greater. This latter difficulty can be overcome by using a deep absorption purification method, as long as equimolar ratios of nitrogen oxides entering the absorption tower are maintained. The aqueous acid recovery treatment method is useful in this regard, since its use can lower the nitrogen oxide content of exhaust gases from 0.19%-0.35% to 0.03%-0.05%. This water-washing step can be added to existing nitrous method plants without major modifications. Sprinkling a 5%-45% sulfuric acid solution onto the separate apparatus through which all the gas flows after the production zone assists in complete oxidation of all sulfur dioxide gas present. Both procedures can be conveniently applied together. Removal of the highly-dispersed sulfuric acid mist from gases entering the absorber, by means of a sanitary electrofilter, increases absorber effectiveness. Combining the above measures on a semi-industrial scale led to acceptable levels of nitrogen oxides, sulfuric anhydride, and sulfuric acid mist emissions. The nitrous process may be intensified by using input gas with a high sulfur dioxide content and a liquid-phase catalyst, as well as with bubbler-type apparatus and emulsification methods. Better methods for heat utilization are still needed. The information presented indicates that the nitrous method for producing sulfuric acid has prospects for further industrial development and improvement. Figures 3; references 20: 16 Russian, 4 Western.

12126/13046  
CSO: 1841/228



FUZZY MODELS AND CONTROL ALGORITHMS FOR MULTIPHASE CHEMICAL TECHNOLOGICAL PROCESSES IN LIGHT OF LIMITED TECHNICAL INFORMATION

Moscow TEORETICHESKIYE OSNOVY KHIMICHESKOY TEKHNologii in Russian Vol 20, No 1, Jan-Feb 86 (manuscript received 2 Jun 83) pp 120-124

[Article by R.A. Aliyev, I.R. Efendiyev and Yu.A. Abilov, Azerbaijan Institute of Petroleum and Chemistry imeni M. Azizbekov]

[Abstract] Mathematical analysis was applied to the management of technical processes involved in the refining of nonethylated A-76 and AI-93 gasolines, in which information is available only at certain fixed instances of time. The basic approach consisted of application of the fuzzy control algorithm proposed by Zadeh [Bellman, R.E. and Zadeh, L.A., Management Sci., 17(4): 141, 1979], with the process divided into two stages: control of qualitative indicators and control of quantitative indicators. A series of recurrence equations were utilized to define the fuzzy optimization algorithm for the temperature parameters of each reactor, proportion of the 85-120°C fraction, utilization of the 85-120°C fraction, and the octane number of the final product. Figures 1; references 4: 3 Russian, 1 Western.

12172/13046

CSO: 1841/435

## COAL GASIFICATION

UDC 553:[97+981

### GAS COMPOSITION OF MODERN PEAT BOGS

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 1, Jan-Feb 86 (manuscript received 9 Aug 84) pp 23-27

[Article by A.G. Yefremova, T.V. Levchenko, T.I. Sycheva and T.Ye. Surkova, All-Union Scientific Research Institute of Natural Gases]

[Abstract] The extent of biochemical gas generation in peat deposits in Smolensk, Vologda, Novgorod, and Pskov areas was studied to the depth of 5-7 m, taking specimens every 0.5 m. Peat decomposition varies from 3-8% in the upper crust to 25-47% in the lower range of the profile. The pH value increased with the depth from 3 to 4.5 m. Free gases were noted at depths below 3 m. The intensity of gas formation increased with the depth; the content of methane increased from 4-8.7% at 3 m to 61% at lower depths, while that of nitrogen dropped from 94.8 to 34%. In contrast to upper and mixed deposits, the muddy deposits of low-lying marsh lands showed no gaseous formations; evidently gas is totally dissolved in pore water or in the peat itself. Gas presence was not related to the specific botanical composition of peat-forming plants; it is strictly related to the hydrological regimen of the peat tract. References: 5 Russian.

7813/13046

CSO: 1841/433

### EFFECT OF $\gamma$ -RADIATION ON STRUCTURE OF DISPERSED COKE COAL

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 1, Jan-Feb 86 (manuscript received 18 Jul 84) pp 45-47

[Article by I.B. Krichko and T.M. Khrenkova, Scientific Research and Design-Construction Institute of Enrichment of Solid Fuels]

[Abstract] Changes in structural parameters of coal occurring under the influence of  $\gamma$ -radiation (from 0.04 to 540 mrad) were studied by chemical analysis and IR spectral methods. It was noted that in the first 10 min of exposure to 0.04 mrad, there occurs an increase of carbon content in aliphatic and alicyclic groups but a decrease in condensed aromatic groups. An increase of the dose to 0.08 mrad resulted in an increase of the  $\text{CH}_{\text{Ar}}$ -groups and a

decrease in  $\text{CH}_2$ -aliphatic ones. With further increase in time or dose, the cycle was repeated. This phenomenon may be connected to three processes: addition of split hydrogen to condensed aromatic structures to give aliphatic compounds, destruction of aliphatic products, and structuralization process. Figures 1; references 4: 2 Russian, 2 Western.

7813/13046  
CSO: 1841/433

UDC 662.74:552

#### PRODUCTION OF DIESEL FUEL FROM BROWN COAL OF KANSK-ACHINSK BASIN

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 1, Jan-Feb 86 (manuscript received 26 Jul 85) pp 73-81

[Article by A.O. Yeremina, A.A. Krichko and M.K. Yulin, Institute of Mineral Fuels]

[Abstract] One of the methods for obtaining diesel fuels is based on hydrogenation of coal. This study was aimed at evaluation of purification of diesel fraction, b.p. 180-360°C in the process of production of high quality summer and winter diesel fuels. The effects of temperature, pressure, crude feeding rate and the ratio of  $\text{H}_2$ :crude material on principal purification indices were evaluated. The optimal purification conditions for a porous AlNiMo-catalyst were: temperature--400°C, pressure--10 MPa, crude feeding rate--1.0  $\text{hr}^{-1}$ , use of 800 l  $\text{H}_2$  per liter of crude material. Under these conditions, total removal of phenols and nitrogen compounds was achieved along with removal of 92.6% of sulfur compounds and 79.1% of hydrogenation of unsaturated hydrocarbons. A diagram is presented covering the steps used in production of diesel fuel components from brown coal of Borodinsk deposits, the quality of which was higher than that of the fuels obtained by hydrogenation of a wide boiling fraction 45-425°C. Figures 3; references 13: 5 Russian, 8 Western.

7813/13046  
CSO: 1841/433

#### EFFECT OF DISPERSION ON REACTIVITY OF COAL DURING HYDROGENATION

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 1, Jan-Feb 86 (manuscript received 30 Nov 84) pp 82-84

[Article by T.M. Khrankova, N.L. Goldenko and Ye.S. Zimina, Institute of Mineral Fuels]

[Abstract] The goal of this work was to investigate the effect of brown coal dispersion and of the chemical structure changes resulting from it on its

reactivity during hydrogenation. It was shown that fine dispersion (down to the micron size) of brown coal performed in air, in presence of catalyst (0.2% Mo and 1% Fe<sup>3+</sup>) led to the following changes: a decreased carbon content in condensed aromatic forms and an increased level in aliphatic and alicyclic CH<sub>2</sub> groups. Evidently, hydrogen is added to condensed aromatic rings leading to saturated aliphatic products. It was shown that the reactivity of such coal was a function of the ratio of carbon content in

$C_{\text{saturated CH}_2} / C_{\text{aromatic}}^{\text{condensed}}$  structures. Figures 1; references 4: 1 Russian  
3 Western.

7813/13046

CSO: 1841/433

## ELECTROCHEMISTRY

### ACTIVATION OF HEXACYANOFERRATE PEROXIDASE OXIDATION BY o-DIANISIDINE IN ELECTROCHEMICAL SYSTEM

Vilnius TRUDY AKADEMII NAUK LITOVSKOY SSR: SERIYA B in Russian No 6, Nov-Dec 85 (manuscript received 22 Oct 84), p 121

[Article by R.A. Vidzhyunayte and Yu.Yu. Kulis, Institute of Biochemistry, LiSSR Academy of Sciences]

[Text] The activation of hexacyanoferrate peroxidase oxidation by o-dianisidine with the use of enzymes immobilized on a carbon-glass electrode is discussed.

The results obtained during the investigation of a correlation between activation and concentration of the substrate and enzymes and thickness of the biocatalytic coating are described with mathematical equations and theoretically substantiated.

The macrokinetic mechanism of the activation process in an electrochemical system is studied.

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CSO: 1841/393-P

ELECTROREDUCTION OF OXYGEN ON CARBON MATERIALS ACTIVATED WITH THERMALLY TREATED COBALT AND IRON  $N_4$ -COMPLEXES

Kiev UKRAINSKIY KHMICHESKIY ZHURNAL in Russian Vol 52, No 1, Jan 86  
(manuscript received 5 Jul 84) pp 38-41

[Article by K.A. Radyushkina, M.R. Tarasevich, Ye.M. Novikova and V.S. Kublanovskiy, Institute of Electrochemistry, USSR Academy of Sciences, Moscow; Institute of General and Inorganic Chemistry, UkSSR Academy of Sciences, Kiev]

[Abstract] One of the effective methods for replacing expensive catalysts for oxygen electrodes in electrochemical generators is based on organic  $N_4$ -complexes of metals which often reach the activity of platinum. Kinetics of cathode reduction of oxygen were investigated by the floating gas diffusion electrode method over cobalt and iron  $N_4$ -complexes pyrolyzed on carbon carrier. The catalyst was prepared by impregnating A-3 carbon with a DMFA solution of the complex (10%); the solvent was evaporated, and the residue was heated to 800° for 30 min. The experiments were done in 1 N KOH or  $H_2SO_4$  solutions. It was shown that pyrolysis of tetra(p-methoxyphenyl)-porphyrins of cobalt and iron (CoTMPP and FeTMPP, respectively) over carbon gave catalysts more effective than carbon-3, especially in acid medium. The mechanism of  $O_2$  electroreduction did not change from that performed on A-3 carbon. Figures 2; references 7: 6 Russian, 1 Western (by Russian author).

7813/13046  
CSO: 1841/436

## EXPLOSIVES AND EXPLOSIONS

UDC 614.841

### POWER APPROACH TO CATEGORIZATION OF INDUSTRIAL INSTALLATIONS BASED ON EXPLOSION HAZARD

Moscow KHIMICHESKAYA PROMYSHLENNOST in Russian No 10, Oct 85 pp 626-629

[Article by A.N. Baratov and V.S. Babkin]

[Abstract] Categorization by explosion hazard regulates the planning, construction, and use of industrial installations. According to the Construction Norms and Rules, an installation is classified as explosion-hazardous if the volume of explosive gases (V) generated exceeds 5% of the free volume of the industrial site. It is also necessary to consider the ability of the facility to withstand an explosion. The explosion load, which is the change in pressure generated, is used as a basic control parameter. This pressure change can be calculated using a simple model of gas combustion in a closed space. An equation was derived for the pressure change in terms of the maximal pressure generated if all the gas burned, the starting pressure, gas volume, total volume, chemical energy liberated, mass, heat effect, and heat capacity. In the simplest case, the change in pressure is a linear function of the energy liberated per unit volume and pressure, and this has been confirmed experimentally. While several processes contributing to chemical explosions have been extensively studied, the interactions between these processes are less well understood. Energy modeling can predetermine the direction of further research in explosion hazards. Dynamic aspects of an explosion must also be considered, since an explosion may result from quasi-static effects, rapid combustion and detonation, or intermediate situations. Figures 2; references 17: 11 Russian, 6 Western.

12126/13046  
CSO: 1841/228

CALCULATION OF INDEX OF SENSITIVITY OF SOLID EXPLOSIVES TO SHOCK

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 286, No 2, Jan 86  
(manuscript received 21 Dec 84) pp 377-380

[Article by A.V. Dubovik, Institute of Chemical Physics, USSR Academy of Sciences, Moscow]

[Abstract] A mathematical formula for calculating the critical pressure for solid explosives was developed based on a number of specific assumptions of linearity in such key variables as the change in melting point versus pressure. Using the formula and published physicochemical data on solid explosives, calculations of the critical pressure gave values with an average  $\pm 6\%$  deviation from experimental values. Calculations with a mixture of plexiglass and ammonium perchlorate were also made and confirmed the interaction of the two substances; i.e., the plexiglass is not an inert additive. The use of the formula and associated parameters thus allows the modeling of the critical conditions for shock initiation of explosives. Figures 1; references 15: 12 Russian, 3 Western.

12672/13046

CSO: 1841/364



## FERTILIZERS

### NEW METHOD FOR PRODUCING MINERAL FERTILIZERS

Leningrad LENINGRADSKAYA PRAVDA in Russian 22 Feb 86 p 2

[Article by K. Rendel]

[Text] One and a half million rubles per year will be saved when a new method for producing mineral fertilizers is introduced.

It was developed by specialists of the Kingisepp Complex Laboratory, the Technical Institute imeni Lensovet, the Leningrad Scientific-Research Institute "Giprokhim," and the "Fosforit" Plant.

The innovation involves producing fertilizers with prolonged activity. The new fertilizer vitamins are effective because they "stretch" over time and help farmers produce high yields in just a few years. It is significant that the innovation not only benefits those who till the earth but also those who manufacture fertilizers. Consumption of sulfuric and phosphoric acids is reduced.

/13046

CSO: 1841/514-P

## RHEOLOGICAL CHARACTERISTICS OF PHOSPHATE SLURRY

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 59, No 1, Jan 86  
(manuscript received 5 Mar 84) pp 66-70

[Article by I.P. Narkevich, O.B. Dormeshkin and A.A. Mezhentsev, Belorussian Technological Institute imeni S.M. Kirov]

[Abstract] Characterization was conducted on phosphate slurry resulting from production of phosphate fertilizer, with comparable rheological data derived for a model slurry prepared in the laboratory, in order to provide criteria for further processing and transportation of this waste category. The fluorophosphate sludge was assessed in terms of kinematic viscosity in relation to temperature, water content, composition, and sedimentation characteristics, with the resultant findings presented in tabulated form. There was an inverse relationship between the kinematic viscosity on one hand, and the temperature and water content on the other. The presence of MgO in a concentration of 0.5-6.0 wt% resulted in a 7-fold increase in viscosity, while decreasing the rate of clarification 4-fold. Relatively low concentrations of iron sulfate (less than 1% as  $\text{Fe}_2\text{O}_3$ ) increased viscosity 3.5-fold with a concomitant 4-fold increase in the rate of clarification. However, a further increase in the concentration of iron sulfate (more than 1% as  $\text{Fe}_2\text{O}_3$ ) led to a decrease in viscosity from 15.4 to 5.8 cs of the test sample. An inverse relationship prevailed between the pH and the kinematic viscosity (200 cs at pH 3, 3.19 cs at pH 5), with the higher pH values favoring formation of a large-size, stable crystalline precipitate. Figures 3; references 5: 4 Russian, 1 Western.

12172/13046  
CSO: 1841/450

## PRODUCTION OF DOUBLE SUPERPHOSPHATE IN DRUM GRANULATION DRYER

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 58, No 12, Dec 85  
(manuscript received 18 Feb 85) pp 2633-2637

[Article by A.A. Kuznetsov, M.V. Lykov and M.A. Shapkin]

[Abstract] Relatively little use has been made of drum granulation dryers in the production of double superphosphate in view of chemical reactivity of the products. A study was undertaken to define and apply this technology in the processing of Kingisepp phosphate rock into double superphosphate, with the phosphate rock reground to  $\leq 10\%$   $< 71 \mu\text{m}$  and the use of wet-process phosphoric acid containing 26.2-30.0%  $\text{P}_2\text{O}_5$ . Optimal conditions for the operation of the rotary granulation dryer included a heat carrier temperature of 900-1000°C at intake and 115-125°C at the outlet, with a gas outflow of 2.1-2.4 m/sec and phosphoric acid consumption equivalent to 72-75 parts  $\text{P}_2\text{O}_5$  per 100 parts phosphorite. The hourly productivity with a 2.8 m rotary dryer with a 17 m working section was on the order of 8.15 t in processing a suspension with 40% water, yielding 5.8 t of available  $\text{P}_2\text{O}_5$ . Figures 3; references 16 (Russian).

12172/13046  
CSO: 1841/411

UDC 631.82

## PHYSICOCHEMICAL AND MECHANICAL CHARACTERISTICS OF NITROAMMOPHOS

Moscow AGROKIMIYA in Russian No 1, Jan 86 (manuscript received 17 Apr 85)  
pp 41-48

[Article by N.L. Malonov, V.A. Kagramanova, A.V. Kononov and Z.F. Ryabova, Scientific Research Institute of Fertilizers, Insecticides and Fungicides, "Minudobreniye" Scientific Production Association, Moscow]

[Abstract] An analysis was conducted on the physicochemical and mechanical characteristics of 23-23-0 nitroammophos produced by the Voskresensk Production Association "Minudobreniye," in order to determine those parameters requiring further improvement. Evaluation of granulometric composition, caking, moisture content, dispersibility, and granular stability in bulk and on storage in polyethylene bags under various storage conditions showed that one key approach to product improvement lies in better management of hygroscopicity. Caking was found to be highly temperature dependent and could be virtually eliminated by maintaining the moisture content at less than 0.4%. For the time being, caking would present a problem when the product is used in the southern regions of the USSR in the summertime. Another factor in diminishing caking would be an increase in the 2-4 mm granule fraction, which diminished caking at 40-60°C. Figures 8; references 8 (Russian).

12172/13046  
CSO: 1841/425

## PHOSPHOGYPSUM ENRICHMENT OF SOIL

Moscow SELSKOYE KHOZYAYSTVO ROSSII in Russian No 12, Dec 85 p 11

[Article by S. Popov, director, Saratov Design Research Station for Agricultural Applications of Chemistry]

[Abstract] Chemical treatment can greatly improve alkaline soils. In one year on the Suvorovskiy Sovkhoz in the Krasnoarmeyskiy Rayon, 7.7 t/ha of phosphogypsum increased the yield of winter wheat from 20 to 27 centners/ha, and on the Khvalinskiy Sovkhoz in Khvalinskiy Rayon, 7.5 t/ha increased the sunflower yield 1.6 times to 4 centners/ha. These improvements continue year in and year out. Our oblast has good prospects for such improvements. The Balakovskiy Chemical Plant realizes over 5 million tons of phosphogypsum as a by-product of phosphoric acid production. Ten tons of phosphogypsum can add 30-100 kg of active phosphorous compounds to a hectare of soil. Agricultural application of the phosphogypsum would require the chemical plant to decrease the moisture and fluorine content of the product. This year, the agricultural research station carried out a detailed assessment of the phosphogypsum potential and drew up a plan for its utilization. The oblast agricultural chemical association organized the transport of the phosphogypsum to nearby farms using 36 KamAZ-5511 dump trucks; in 1984, Saratov Oblast applied 150,000 tons of phosphogypsum to 24,300 ha. By 1990, this is projected to increase up to 50,000 ha in a 6-7 year cycle of applications.

12672/13046

CSO: 1841/355

UDC 622.78:[661.635.41+661.635.2]

## INVESTIGATION OF PROCESS FOR OBTAINING FUSED CALCIUM-POTASSIUM PHOSPHATES

Moscow KHIMICHESKAYA PROMYSHLENNOST in Russian No 10, Oct 85 pp 596-597

[Article by V.S. Podkhalyuzin, N.N. Derbunovich and B.V. Drachev]

[Abstract] As part of the search for less expensive methods for producing potassium phosphate fertilizers, the possibility of obtaining fused calcium-potassium phosphates from apatite concentrate, potash, and calcined quartz sand was investigated. The melts were formed in a corundum crucible which was agitated and maintained at 1450° for 15 minutes, followed by water quenching. The results were represented as solubility isolines in 2% citric acid, as a function of apatite,  $K_2O$ , and  $SiO_2$  concentrations. Melting temperature isotherms were also constructed. The products obtained were not homogeneous glasses, but rather mixtures of crystalline phases. One of the most suitable starting conditions was a ratio of apatite: $K_2O$ : $SiO_2$  of 1:4:6, which gave a melt containing 24.4%  $P_2O_5$  and 21.6%  $K_2O$ . This melted at 1240-1310° and contained 40%-45% nutritive substances soluble in ammonium citrate. The results indicate that it is possible to obtain fused calcium-potassium phosphates by the electrothermal method. Figures 2; references 3 (Russian).

12126/13046

CSO: 1841/228

## BEST SOURCE OF NITROGEN. USE OF LIQUID AMMONIA

Moscow SELSKOYE KHOZYAYSTVO ROSSII in Russian No 12, Dec 85 pp 41-43

[Article by V. Gorbachev, chairman, Selkhozkhimiya Association, Kuybyshev Oblast]

[Abstract] On the average, black-earth soils in Kuybyshev Oblast have 120-150 tons of humus per hectare with a total nitrogen content of 6-7.5 tons. A harvest of 30 centners per hectare of winter wheat uses 120 kg of this nitrogen. In the period 1976-1980, the yearly nitrogen loss averaged 51.3 kg/ha, with some rayons reaching over 100. Without fertilizer, natural nitrogen additions cannot balance the depletion by crops. Despite the increase of fertilizer from 80,000 to 175,500 tons in 1976-1980, only 62% of the nitrogen use was compensated for in this oblast. This year, 31.5% of the overall volume is liquid ammonia--over 60,000 tons have been applied to 590,000 ha. It is considerably more cost-efficient than ammonium nitrate, but requires careful handling. It is not easily absorbed into dry soil and can foul machinery with freezing earth in wet soils. However, the ammonia gradually turns to nitrates and results in a more evenly distributed application. By experience, along with 50 kg/ha of phosphorus and potassium fertilizers, ammonia usage ranges from 50-60 kg/ha for winter grains to 120 kg/ha for silage and potatoes. For barley on nonirrigated land, the optimum application was 90 kg/ha, which increased the yield by 3.1 centners to 35.6 centners/ha and improved its protein content. It has been particularly effective in increasing corn silage, with yields up to 160 centners/ha. This year in the oblast, it is being applied to 240,000 ha of feed acreage and 18,000 ha of pasture. It can also be added to irrigation water. Significant improvements in oats and rye yields were also observed. It now comprises 80% of all the nitrogen fertilizer in the oblast and can be applied throughout the growing season. In light soils it is applied at a depth of 16-18 cm, and in heavy soils at 10-12 cm. Ammonia utilization is also aided by the application of new machinery and improved handling and storage facilities. Workers handling this material receive special training and careful medical supervision. By 1990, up to 150,000 tons of liquid ammonia will be used in the oblast. Figures 1.

12672/13046  
CSO: 1841/355

## FOOD TECHNOLOGY

### EDIBLE MEAT PROTECTANT WRAPPING FILM

Moscow ZNANIYE-SILA in Russian No 3, Mar 86 p 7

[Text] During refrigeration and freezing, meat dries, and its moisture evaporates. But moisture in meat is in an optimum ratio with protein, fat, and carbohydrates, so its depletion, along with loss of total meat mass, leads to deterioration in quality. Losses from drying during refrigeration and freezing contribute more than 85% to the overall loss during refrigeration, storage, and transport. On a national scale, that translates to more than 100,000 tons per year. How can these losses be averted or at least reduced?

The chemical industry manufactures various moisture-resistant polymer materials, some in response to sanitary hygiene demands. These are used in the meat industry for packaging. However, only the graded, packed meat which has already been refrigerated is packaged, so essential losses from drying have already occurred. To package warm meat is impossible due to a decrease or ceasing of vapor exchange with the external environment--it "suffocates," acquiring an acidic odor and a change in the natural color.

A collective of scientists from the Institute of Chemical Sciences, Academy of Sciences, Kazakh SSR, under the leadership of Academician of the Academy of Sciences, Kazakh SSR, M.I. Goryayev, and Director of the Planning-Construction and Technical Bureau of Minmyasomolprom, Kirgiz SSR, A.I. Yakovlev, created a protective film-forming coating based on acetylated monoglycerides of edible oils. The development was accepted as an invention; it was given author's license number 540616. The emulsion, prepared by the specially developed technique (except for the monoglycerides of edible oils), consists of acetylated derivatives of the monoglycerides, water, starch, and sorbic acid. The coating is edible; its use has been approved by Minzdrav, USSR.

After applying the coating in a special chamber by spraying at a pressure of 10-12 atm with a centrifugal nozzle for 5-7 seconds, a film forms on the meat. It prevents the evaporation of moisture, decreasing losses due to drying.

As established during the use of this technique at the Tokmakskiy Meat Plant in Kirgiziya, losses during refrigerating and freezing meat decrease by an

average 20%. It is not difficult to calculate the effect of applying such a protective coating--1,000 tons of meat or 10,000,000 rubles can be saved per year.

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CSO: 1841/515-P

## PRESERVATIVES IN FOOD HANDLING AND STORAGE

Moscow SELSKOYE KHOZYAYSTVO ROSSII in Russian No 12, Dec 85 pp 49-50

[Article Yu. Snetkov, Chief Zoological Technologist, Administration of Applications of Chemistry to Animal Husbandry, Rosselkhozkhimiya Association, VPNO]

[Abstract] Preservatives can significantly decrease the loss of nutrient value of feed during processing and storage. Benzoic acid, sodium pyrosulfate and bisulfate, and a concentrate of low-molecular-weight organic acids are the usual choices. Within the Russian republic, their use increased from 9,000 tons in 1980 to 32,000 tons last year. In 30 oblasts of the RSFSR, their use lowered the losses of nutrients and feed mass by 12-18%. Silage stored with preservatives contained an average of 76.9 gm protein and 23 gm sugar/kg, compared to 63.9 and 8.7 gm for silage without preservatives. The silage with preservatives averaged much higher gradings than silage without preservatives. Expenditures for preservatives were very cost-effective. On one kolkhoz, silage stored for 90 days with organic acids retained 54% of its sugar, 82% of its nitrogen, and 61% of its carotene, compared to 9%, 47%, and 11%, respectively, for silage without preservatives. Generally, a farm will work with one type of preservative so that cattle will become accustomed to the taste of the feed and not reject it. Preservatives were effective in all the climatic zones of the RSFSR. In the warmer regions, high sunshine leads to a different spectrum of bacterial flora in the feed and can increase the loss of nutrients; it can also lead to rapid drying of fodder and subsequent increases in handling losses. Preservatives can help in all these cases. Overall, they can increase available fodder without any increase in planted acreage. Figures 1.

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CSO: 1841/355



## ANTARCTIC KRILL AS SOURCE OF NUTRITIONAL PROTEIN

Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 1, Jan 86 pp 73-82

[Article by S.V. Rogozhin, doctor of chemical sciences]

[Abstract] Several laboratories at the Institute of Heteroorganic Compounds imeni A.N. Nesmeyanov are currently engaged in studies on nontraditional sources of nutrients, including the use of Antarctic krill as a source of edible protein. One of the key advantages of utilizing marine animals is that biomass accumulation requires neither material nor energy resources, other than those connected with harvesting. In addition, the proteins of such animals often exceed the proteins of warm-blood animals in nutritional value for man. Current technology allows the processing of krill in such a manner as to ensure utilization of 80-85% of krill protein, of which 50-55% can be obtained in the form of highly nutritious products. The remaining 20-25% of the protein is suitable for feed use. Additional valuable by-products are obtained in the form of lipids, enzymes, and chitin. The latter, as well as its deacetylated congener chitosan, find various uses in medicine as anti-coagulants, hemostatics, antineoplastics, and so forth. In addition, these products have also been applied to ion exchange technology and used as flocculants. Figures 3; references 6: 4 Russian, 2 Western.

12172/13046

CSO: 1841/418

## INORGANIC COMPOUNDS

### PREPARATION OF EXTRA-PURE INORGANIC FLUORIDES

Moscow NTR: PROBLEMY I RESHENIYA in Russian 18 Feb-3 Mar 86, p 5

[Text] Crystalline compounds of fluorine with lithium, calcium, magnesium, barium and other elements have long been well known in science and technology, chiefly as materials for infrared optics. One of the main obstacles in employment of these compounds has been the fact that their crystals require extensive purification. The presence of even a minute amount of impurities, particularly oxygen, markedly worsens the optical properties of the crystals and makes them unsuitable for technical purposes.

At the Tadzhik Academy of Sciences' Institute of Chemistry imeni Nikitin, promising methods have been developed for synthesizing inorganic fluorides of high purity and obtaining various mixed compositions with properties prescribed in advance, on the basis of these fluorides.

This research was conducted in close contact with the State Optics Institute imeni Vavilov, the USSR Academy of Sciences' Institute of Crystallography, the All-Union Scientific Research Institute of Electric Carbon Products, and other organizations. In the course of this work, experimental prototypes of fluoride crystals of high purity which were synthesized in Dushanbe were thoroughly tested, and recommendations for improving their quality were proposed.

A semi-industrial unit for obtaining materials of high purity was developed and a process for obtaining them was perfected in the experimental production section of an academy special design and technological bureau. These materials are being produced in increased lots in line with contracts and orders from specific enterprises.

FTD/SNAP  
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CSO: 1841/500

# CHEMICAL METHOD FOR COPPER-COATING GLASS

Kiev PRAVDA UKRAINY in Russian 7 Jan 86 p 4

[Excerpt] A new development for chemical metal-coating of glass materials has been turned over to the "Kineskop" (picture tube) Production Association by associates of Lvov University. This method makes it possible to replace expensive silver with copper, for example. Films made of copper are equal to the precious metal in durability, reflecting quality and heat resistance.

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CSO: 1841/500

## RHODIUM-COATING PROCESS FOR CONTACTS OF ELECTRONIC DEVICES

Moscow PRAVDA in Russian 3 Feb 86 p 2

[Text] Kiev, Feb 2 (TASS)--Contacts of electronic devices are 'clad' in gold and silver, so that the equipment will operate more reliably. The use of such precious metals is made unnecessary thanks to a new process which scientists of the Ukrainian Academy of Sciences' Institute of General and Inorganic Chemistry have developed. They have proposed coating contacts with a very thin layer of rhodium, which is a more common metal.

This innovation is being introduced in precision instrument building. Parts which possess exceptional hardness, wear resistance and heat resistance are needed in the instrumentation of airplanes, spaceships and seagoing vessels. Rhodium meets these requirements. It does not melt even in the crater of a volcano. Dents, scratches and rust spots do not occur on its surface. It does not dissolve in corrosive liquids, and it does not become tarnished over time, as silver does. The electric conductivity of this material does not change when heated.

The new process has already been introduced at a number of enterprises. It saved about a half million rubles last year.

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CSO: 1841/500

PRIZE NOMINATION FOR WORK ON EXTRA-PURE VOLATILE SUBSTANCES

Moscow IZVESTIYA in Russian 17 Mar 86 p 3

[Article by N. Zhavoronkov and A. Prokhorov, academicians]

[Abstract] The authors comment on the significance of research whose results are presented in a work-cycle entitled "Development of Methods for Obtaining Volatile Substances of High Purity," by Academician G. Devyatykh. The authors endorse the nomination of this work for the 1986 Lenin Prize.

Most of the work dealt with in the cycle is said to be original in its field in both Soviet and world science. Devyatykh and his pupils are credited with developing methods for obtaining substances which equal or surpass their foreign counterparts in terms of purity. Thanks to progress which was made in the mid-1970's in obtaining volatile chlorides of high purity, work on fiber optics has advanced rapidly and the USSR's first optical-fiber communications lines have been developed, the authors relate. Highly pure materials have been developed by the USSR Academy of Sciences' Institute of Chemistry, which is also producing a certain amount of these materials directly.

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CSO: 1841/500

## MECHANICAL ALLOYS OF MAGNESIUM--NEW MATERIALS FOR HYDROGEN ENERGETICS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 286, No 2, Jan 86  
(manuscript received 13 Feb 85) pp 385-388

[Article by Ye.Yu. Ivanov, I.G. Konstanchuk, A.A. Stepanov and V.V. Boldyrev, corresponding member, USSR Academy of Sciences; Institute of the Chemistry of Solid Bodies and of the Processing of Mineral Raw Materials, Siberian Department, USSR Academy of Sciences, Novosibirsk]

[Abstract] Although Mg metal is an excellent storage medium for hydrogen in terms of volume held, its interaction is slow (especially on the first cycle) and very dependent on morphology. Simple mixing of magnesium with catalysts is not effective, and binary melts often lack homogeneity, if they can even be formed. Mechanical alloying of metallic powders in a planetary mill under an inert atmosphere can solve these problems and introduce such metals as Fe, Ti, and Nb into the matrix. X-ray analysis confirms the absence of any additional intermetallic compounds. Four types of additives were examined: Ni (forming intermetallide  $Mg_2Ni$ ); Ce, Nb, and Ti, whose hydrides can act as hydrogen pumps for the Mg; Fe and Co, catalysts not forming hydrides; and Si and C, forming covalent compounds with magnesium. Except for the Si and C systems, the reactions with hydrogen was similar in all cases, with significant increase in the rate of reaction in the first cycle and apparent formation of active catalytic centers on the surface of the mechanical alloys. Subsequent cycles retain high rates of hydrogenation and dehydrogenation and have a high volume retention of hydrogen (up to 5%). Additions of Fe, Nb, Ti, and Co apparently prevent agglomeration of Mg hydrides which can form layers impenetrable to hydrogen. They also form new ternary hydrides such as  $Mg_2FeH_6$  and  $Mg_2CoH_5$ . The Mg and C systems show changes in mechanical properties and the appearance of fissures, apparently from the formation of carbides and silicides. Overall, these mechanical alloys show significant promise as efficient storage vehicles for hydrogen. Figures 4; references 8 (Western).

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CSO: 1841/364

UDC 66.093.6:661.424.5

## METHODS FOR ECONOMIZING IN MATERIAL AND LABOR USE DURING SYNTHETIC CARNALLITE DEHYDRATION

Moscow KHIMICHESKAYA PROMYSHLENNOST in Russian No 10, Oct 85 pp 597-599

[Article by I.L. Reznikov, G.Yu. Sandler, V.P. Svidlo, A.B. Krayukhin and Ya.D. Lysyak]

[Abstract] At the Chlorvinyl Production Association, the production of magnesium and chlorine from magnesium chloride caustic waste obtained via

complex processing of chloride-sulfate mineral salts has been adopted for the first time in the USSR. The process involves production of synthetic carnallite ( $\text{KCl} \cdot \text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ ) from desulfurized  $\text{MgCl}_2$  and  $\text{KCl}$ , followed by two drying stages and electrolysis. In order to improve the compositional stability of the carnallite and thus make its processing more predictable, it was necessary to lower the proportion of  $\text{MgCl}_2$  to 29.0%-30.5% and increase the amount of  $\text{NaCl}$  to 6.0%-8.0%. The ratio of  $\text{KCl}$  to  $\text{MgCl}_2$  was thus 1.05-1.10. The free water and mother liquor content were also increased and crystallinity decreased. Various changes in the design of the boiling layer furnaces used to dry the carnallite were made to improve drying. Drying temperatures were lowered by about  $50^\circ$  and gas flows modified, relative to the drying process used for enriched carnallite. The use of a more rational process resulted in a lowering of the amount of dust and moisture in the final product, with water levels of less than 3% being achieved. The extent of hydrolysis was somewhat elevated, partially due to the breakdown of chlorate impurities. The productivity of the process is limited by that of the first oven chamber, where all free water and 1.5-3 moles of water of crystallization must be removed. Further improvements can be made by lengthening the first chamber, increasing the temperature of the heating gases and cooling the gas-distribution lattice. Figures 1; references 5 (Russian).

12126/13046  
CSO: 1841/228

UDC 666.968

#### IRON (III) HYDROXONITRATE AND HYDROXOSULFATE ADHESIVES

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 58, No 12, Dec 85  
(manuscript received 7 Apr 85) pp 2662-2665

[Article by G.M. Barvinok, M.M. Sychev and N.Yu. Germash]

[Abstract] Spectral and mechanical analyses were conducted on adhesives prepared from iron (III) hydroxonitrates and hydroxosulfates containing  $[\text{OH}^-]/[\text{Fe}^{3+}]$  ratios of 1.0 to 2.0 and  $[\text{Fe}^{3+}]/[\text{SO}_4^{2-}]$  ratios of 0.99 and 1.98, respectively. Using various conventional adhesive fillers as hardeners led to preparation of 1 x 1 x 1 cm cubes and cylinders ( $d = 10$  mm,  $h = 10$  mm) for mechanical testing.  $\text{MgO}$  and  $\text{CuO}$  imparted excellent bonding qualities to the Fe(III) hydroxonitrates and hydroxosulfates, whereas  $\text{SiO}_2$  fillers failed to give adhesives. Highest tensile strength materials in the Fe(III) hydroxonitrate series were obtained with  $[\text{OH}^-]/[\text{Fe}^{3+}] = 1.0$ ; equivalent strengths were obtained with Fe(III) hydroxosulfates with  $[\text{Fe}^{3+}]/[\text{SO}_4^{2-}] = 0.99$  and 1.98. In the case of  $\text{MgO} + \text{Fe(III) hydroxosulfates}$  maximal strength was obtained after annealing at  $200^\circ\text{C}$ . IR spectroscopy indicated that adhesiveness was predicated on polycondensational processes. Figures 1; references 13: 12 Russian, 1 Western.

12172/13046  
CSO: 1841/411

# PHASE COMPOSITION OF SODIUM POLYALUMINATE WITH A STRUCTURE OF LITHIUM ALLOYED $\beta$ -ALUMINA

Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 52, No 1, Jan 86  
(manuscript received 11 Mar 84) pp 99-100

[Article by A.G. Belous, G.N. Novitskaya, K.P. Danilchenko and A.N. Antishko, Institute of General and Inorganic Chemistry, UkSSR Academy of Sciences, Kiev]

[Abstract] Sodium polyaluminate containing  $\text{Li}_2\text{O}$  additives was studied using x-ray phase analysis method ( $\text{Na}_2\text{O} \cdot 6\text{Al}_2\text{O}_3 \cdot n\text{Li}_2\text{O}$  was used, where  $n = 0.02; 0.055; 0.07; 0.09; 0.14; 0.23; 0.33; 0.48; 0.61; 0.95$  and  $1.18$ ). Powder compositions with  $n = 0.02$  to  $0.09$  did not differ from sodium aluminate without  $\text{Li}_2\text{O}$  additive. Specific electroresistance in this range of values decreased with increasing concentration of lithium. Further increase in  $\text{Li}_2\text{O}$  led to larger specific electroresistance.

7813/13046  
CSO: 1841/436

UDC 621.74.045:658.611.1

## NEW GUIDELINES FOR PRECISE CASTING IN CERAMIC MOLDS

Moscow KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE in Russian No 1, Jan 86  
p 29

[Article by Yu.G. Khmelev, candidate of technical sciences]

[Abstract] New guidelines, entitled RD 26-17-048-85 "Typical Precise Casting Technology in Ceramic Molds Conforming with Constant Models," went into effect on October 1, 1985. These guidelines cover all the technical eventualities in forming precise casts from iron, steel, and various metal alloys for low-demand intricate items. It has been anticipated that the implementation of these new guidelines in the chemical and petroleum mechanical engineering industry will be cost effective in an amount exceeding 160,000 rubles.

12172/13046  
CSO: 1841/419



## NITROGEN COMPOUNDS

UDC [661.25:546.226/171.2-325].002.1(71)

### INVESTIGATION OF WORKING CONDITIONS AND PROCESS SUBOPTIMIZATION IN PRODUCTION OF SULFAMINIC ACID

Moscow KHIMICHESKAYA PROMSHLENNOST in Russian No 10, Oct 85 pp 629-630

[Article by M.D. Kats and N.I. Savostyanov]

[Abstract] Random search, Boolean model, and logical programming techniques were used to study the production of sulfaminic acid. The range of all process variables was defined and random search was then used to plan experiments. The data so generated were then searched for local process optima and to construct a Boolean model of "better" and "worse" classes. Logical programming was used to describe local areas in which each object function assumes a value not less than an assigned minimum. This led to recommended technological process norms. The model was verified using the production of sulfaminic acid by sulfonation of urea with fuming sulfuric acid. Better results were defined as a yield of at least 85%, weight fraction of sulfaminic acid at least 95%, and free sulfuric acid content no more than 3.5%. Of the 41 experiments conducted, 19 satisfied the yield requirement, 16 the quality requirement, and 9 both. Compromise suboptimization was used to construct local optima of the 18 process variables monitored. Use of optimum values of the variables increased yield from 83.6% to 85.0% and wt. fraction of sulfaminic acid from 83.0% to 95.2%, while decreasing free sulfuric acid content from 6.0% to 2.58%. The optimized process produced, in 1.5 months, what normally took 6 months. References 6 (Russian).

12126/13046  
CSO: 1841/228

ORGANOMETALLIC COMPOUNDS

UDC 547.242

ELIMINATION REACTIONS BETWEEN TERTIARY ARSINE OXIDES AND SULFIDES AND ALKYL HALIDES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 56, No 1, Jan 86  
(manuscript received 25 Mar 85) pp 228-229

[Article by B.Ye. Abalonin, L.A. Lokhotskaya and Z.M. Izmaylova, Kazan State Pedagogical Institute]

[Abstract] Tertiary arsines were synthesized by the reaction of triphenylarsine oxides and sulfides with benzyl bromide with isolation of triphenylarsine and identification of benzaldehyde. The use of ethyl bromide or iodide led to beta-elimination with the formation of olefins, in addition to alpha-elimination which resulted in acetaldehyde. Thermal decomposition of triethyl(ethylthio)arsonium, synthesized by the reaction of triethylarsine sulfide with ethyl bromide, yielded a variety of gaseous products that included lower paraffins in addition to olefins. References 3 (Russian).

12172/13046  
CSO: 1841/449

UDC 532.739.2

SOLUBILITY AND COORDINATION OF CADMIUM ACETATE IN REACTIONS WITH PORPHYRINS IN WATER-ORGANIC SOLVENTS

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 60, No 1, Jan 86  
(manuscript received 28 Mar 84) pp 109-113

[Article by O.A. Golubchikov, Ye.M. Kuvshinova and B.D. Berezin, Institute of Chemistry of Nonaqueous Solutions, Ivanovo]

[Abstract] Solubility studies were conducted on equilibrium hydration of  $\text{CdAc}_3$  in pyridine, dioxane, and tetrahydrofuran at 298.15 K, which demonstrated that in strongly coordinating aprotic solvents the water molecules solvate the anion component of the salt via hydrogen bond formation. This view was supported by the catalytic effects of water on coordination of  $\text{CdAc}_3$  with tetraphenylporphine and with tetra(p-methoxyphenyl)porphine in pyridine. The reactivity of both porphyrins was identical and dependent in the same manner

on the composition of the binary solvent, suggesting that the rate of complex formation was controlled by the change in the ionization status of  $\text{CdAc}_3$ . The increase in the reactivity of  $\text{CdAc}_3$  on hydration is apparently largely dependent on its degree of ionization. Figures 1; references 19: 15 Russian, 4 Western.

12172/13046  
CSO: 1841/412

UDC 547.241

#### SYNTHESIS AND SELECTED CHARACTERISTICS OF ARSENIC-CONTAINING ACETYLENE ALCOHOLS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 56, No 1, Jan 86  
(manuscript received 27 Mar 85) pp 124-126

[Article by Z.U. Panfilovich, N.R. Ivanova, K.I. Kuzmin and I.P. Lipatova]

[Abstract] In order to expand the use of arsenical acetylene compounds in organic synthesis, novel alcohols in this class were synthesized by the reaction of alkyldiethynylarsines with magnesium bromoethyl, followed by reaction with carbonyl compounds in tetrahydrofuran by heating in a water bath. Using reagent ratios of 1:1.5:1.5, seven novel alcohols were synthesized, including 3-ethylethynylarsinyl-2-propin-1-ol and 6-ethylethynylarsinyl-5-hexin-4-ol. The alcohols were syrupy substances that darkened on standing at room temperature and decomposed on distillation. Tabulated data are provided on the chemical and physical characteristics of these compounds. References 2 (Russian).

12172/13046  
CSO: 1841/449

ORGANOPHOSPHORUS COMPOUNDS

UDC 547.26'118

PHOSPHORYLATED NITROGENOUS HETEROCYCLIC COMPOUNDS. PART 10. PHOSPHORYLATION BY P-32 ATOMS CATALYZED BY AZOLES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 56, No 1, Jan 86  
(manuscript received 17 Apr 85) pp 69-72

[Article by A.M. Makarov, G.L. Matevosyan and P.M. Zavlin, Perm State University imeni A.M. Gorkiy]

[Abstract] Various azoles were tested for catalytic efficiency of  $^{32}\text{PCl}_3$  in the phosphorylation of alcohols, using a system consisting of  $\text{CCl}_4$ --1-butanol--2,2,3,3-tetrafluoropropanol--azole subjected to neutron irradiation from a Po-Be source for 240 h at 20-25°C, with a neutron density of  $10^8$  neutrons/sec. The highest efficiency was obtained with 1,2,3-benzotriazole, which resulted in a 54% yield of dibutyl(1,1,3-trihydroperfluoropropyl)[ $^{32}\text{P}$ ] phosphate. These results were explained on the basis of the Atherton-Todd reaction involving intermediate formation of dibutyl[ $^{32}\text{P}$ ] phosphite. The phosphorylating efficiency of the latter determined the course of the reaction, with the catalytic role of the azoles attributed to their susceptibility to phosphorylation. Figures 2; references 7 (Russian).

12172/13046  
CSO: 1841/449

UDC 548.737

SYNTHESIS AND X-RAY ANALYSIS OF PHOSPHONIUM SALTS WITH N,N-DIALKYLTHIOCARBAMOYL SUBSTITUENTS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 55, No 12, Dec 85  
(manuscript recieved 7 Jun 84) pp 2701-2705

[Article by L.Yu. Ukhin, Z.S. Morkovnik, D.S. Yufit and Yu.T. Struchkov, Scientific Research Institute of Physical and Organic Chemistry, Rostov State University imeni M.A. Suslov; Institute of Heteroorganic Compounds imeni A.N. Nesmeyanov, USSR Academy of Sciences, Moscow]

[Abstract] Triphenylphosphorus reacted readily with 1,2,4,5-tetrathian-3,6-bis(N,N-dialkyliminium) bisperchlorates in acetonitrile acidified with

$\text{HClO}_4$  on heating to form triphenylphosphine sulfide and N,N-dialkylthiocarbamoyltriphenylphosphonium in yields of 76-90%. An interesting feature of the latter products (diethyl and dimethyl) was the nonequivalence of the alkyl substituents on the nitrogen atom in the crystalline state on the basis of x-ray analysis, and in solution on the basis of PMR data. Structural information regarding bond lengths, valence angles, and coordinates of non-hydrogen atoms and their isotropic equivalent temperature factors are summarized in tabular form for the diethyl and dimethyl products. References 9: 8 Russian, 1 Western.

12172/13046  
CSO: 1841/414

UDC 542.91:547.1'118

#### DICOORDINATED PHOSPHORUS ATOM DERIVATIVES IN REACTIONS WITH ISOCYANATES

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 1, Jan 86 (manuscript received 3 Jul 84) pp 169-171

[Article by B.A. Arbuzov, E.N. Dianova and Ye.Ya. Zabolotina, Chemical Institute imeni A.M. Butlerov, Kazan State University imeni V.I. Ulyanov-Lenin]

[Abstract] Reaction of 2-acetyl-5-methyl-1,2,3-diazaphosphol (I) with phenyl-, naphthyl-, trimethylsilylisocyanates and phenylisothiocyanates was investigated using NMR  $^{31}\text{P}$  and IR spectroscopy. No products could be isolated in pure state. They were unstable even at 20°C and reverted back to the starting I. Presence of 4 substituted diazaphosphols was supported by spectroscopic data. References 5: 4 Russian, 1 Western.

7813/13046  
CSO: 1841/434

## PESTICIDES

UDC 632.952:633.11

### IMPACT [FUNGICIDE]

Moscow ZASHCHITA RASTENIY in Russian No 12, Dec 85 p 48

[Abstract] In most European countries, the fungus Erysiphe graminis causes high harvest losses in grain crops. In moist seasons, rust diseases can also destroy 10-20% and even 50% of a crop. Other fungus diseases, such as sesptoria, also cause significant losses, so fungicides are critical for good wheat harvests. A useful fungicide, Impact is prepared from 2-(1N-1,2,4-triazolyl-1)-1-(2-fluorophenyl)-1-(4-fluorophenyl) ethanol. This white crystalline product has a melting point of 130°C and is soluble in water, dimethylsulfoxide, ethanol, acetone, and dichloromethane. It has a low toxicity, with an LD<sub>50</sub> of 1140-1480 mg/kg for rats. It is available as a 12.5% suspension and in various mixtures. It is a wide-spectrum fungicide which can be used to treat seeds or as a spray. As effective as mercurio-organic compounds, it acts systematically against Ustilago tritici and U. nuda. Regular observations of fields and timely application of the fungicide can provide good protection. Impact is widely used in European countries. In West Germany, it has been shown to be more effective than Bayleton or Tilt. It is now available in the USSR. Figures 1.

12672/13046

CSO: 1841/356

UDC 547.466:547.57

### THERMAL STABILITY OF N-ARYL SUBSTITUTED ALPHA-AMINO ACIDS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 59, No 1, Jan 86  
(manuscript received 26 Sep 84) pp 222-224

Article by V.Ye. Antipanova, V.T. Gilmkhanova and V.V. Maslennikova]

[Abstract] In view of the importance of N-aryl derivatives of alpha-amino acids as intermediates in the synthesis of herbicides, a study was conducted of their thermal stability over the temperature range of 120-140°C. The sealed ampule studies demonstrated that N-3,4-dichlorophenylalanine undergoes intermolecular condensation to form 1,4-[N-3,4-dichlorophenyl]-2,5-dimethyl-3,6-diketo-piperazine, with only a small proportion of the molecules

decomposing to CO<sub>2</sub> and 3,4-dichloroaniline. Tabulated data on the melting and decomposing temperatures of a series of congeners indicated that molecules with a halogen atom on the benzene ring possessed the greatest thermal stability, whereas those with an alkyl or an alkoxy group generally decompose on melting. Figures 1; references 6: 3 Russian, 3 Western.

12172/13046  
CSO: 1841/450

UDC 632.95

#### PESTICIDE TOXICITY FOR SILKWORMS

Moscow AGROKHIMIYA in Russian No 1, Jan 86 pp 127-135

[Article by O.Yu. Yeremina]

[Abstract] A brief review is presented of Soviet and Western literature on the problems encountered in silkworm breeding when faced with pesticidal toxicity. The pros and cons of pesticidal use are analyzed, including the advantages and disadvantages of biological control measures commonly used in pest control, e.g., *Bacillus thuringiensis*. The chemical agents given coverage are summarized in tabular form and categorized as to their chemical nature. Coverage is also accorded to selected agents of plant origin. In terms of toxicity for the silkworm, the agents are classified into highly toxic (residual activity for 10-27 days), moderately toxic (4-9 days), and agents with low toxicity (1-3 days). The leaves treated with the latter agents can be used for silkworm feeding 1-4 days after treatment with the pesticide. References 55: 1 Polish, 1 Ukrainian, 2 Bulgarian, 18 Russian, 33 Western.

12172/13046  
CSO: 1841/425

UDC 547.595

#### STRUCTURE-BIOLOGICAL ACTIVITY RELATIONSHIPS OF CARBOXYLIC ACID ANILIDES: COMPUTER-BASED DESIGN OF POTENTIALLY ACTIVE STRUCTURE

Moscow AGROKHIMIYA in Russian No 1, Jan 86 (manuscript received 11 Dec 84)  
pp 99-106

[Article by L.A. Tyurina, V.A. Semenov (deceased), Ch.Sh. Kadyrov, A.T. Ayupova and L.V. Molchanova, All-Union Scientific Research Technological Institute of Herbicides and Plant Growth Regulators, Ufa]

[Abstract] A special algorithm was designed to facilitate computer-based design of herbicidal agents based on an analysis of nitro- and acetanilides of carboxylic acids showing such activity. The analysis involved identification

of key chemical groups of 61 compounds involving 23 descriptors (e.g.,  $\text{CH}_3$ ,  $\text{CH}_2$ ,  $\text{C}=\text{C}$ ,  $\text{NO}_2$ ,  $\text{Cl}$ , 2,4-bis-substituted phenyl,  $\text{NCO}$ ,  $\text{O}$ ,  $\text{C}_6\text{H}_5$ , etc.) ranked on an 'informativity' basis ranging from -1 to +1. On the basis of the evaluation, 14 indicator groups were tabulated which permitted classification of 90% of the nitro- and acetanilides in terms of herbicidal activity. The theoretical analysis was confirmed in experimental studies with amaranth in which the compounds of interest exhibited herbicidal activity in low doses. References 12: 11 Russian, 1 Western.

12172/13046

CSO: 1841/425



## PETROLEUM PROCESSING INDUSTRY

### HIGH-SPEED ANALYZER FOR FINDING AVIATION FUEL IMPURITIES

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 29 Jan 86 p 2

[Article by G. Namtalashvili, correspondent (Tbilisi)]

[Text] The Research-and-Production Association "Analitpribor" (analytical instruments) in Tbilisi has begun series production of analyzers for determining quantities and sizes of contaminant substances in aviation fuel, oils and lubricating materials. The new automatic instrument takes only a few minutes to perform a complex operation which used to take 6-8 hours. It will help to heighten the reliability and service life of aviation technology. Specialists of the Association who developed the new instrument have been awarded gold, silver and two bronze medals of the USSR Exhibition of National Economic Achievements.

FTD/SNAP

/13046

CSO: 1841/500

## GASOLINE ADDITIVE

Moscow KHIMIYA I ZHIZN in Russian No 2, Feb 86 p 36

[Text] Specialists at the VNII for Oil Processing developed an additive for automobile gasolines which exhibits cleansing, antifreezing, and protective properties. Over a period of a few years, it was tested in AI-93 and A-76 gasolines in "Zhiguli" and "Volga" automobile engines. The tests showed that the new additive, incorporated into the fuel in extremely small quantities (0.4%), reduces the consumption of gasoline, losses from corrosion, and expenses for routine maintenance and adjusting the carburetor. The yearly economic effect is 3,640 rubles per ton of this substance. It should be noted that the additive safeguards against contamination and freezing of the carburetors and therefore somewhat reduces the toxicity of exhaust gases.

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/13046

CSO: 1841/514-P

UDC 541.182.45:661 185

COLLOIDAL-CHEMICAL PROPERTIES OF SURFACTANT SOLUTIONS FOR REMOVAL OF  
HYDROCARBONS FROM SOLID SURFACES USING FOAM

Moscow KOLLOIDNYY ZHURNAL in Russian Vol 48, No 1, Jan-Feb 86 (manuscript  
received 10 May 84) pp 156-159

[Article by N.N. Kruglitskiy (deceased), V.K. Tikhomirov and V.N. Goncharov,  
Institute of Colloid Chemistry and Water Chemistry, UkSSR Academy of  
Sciences, Kiev]

[Abstract] Removal of hydrocarbons from solid surfaces is a very important  
problem, especially in long range pipelines. Surfactant foams are used to  
clear such conduits. To select the proper composition of such cleaners,  
several basic requirements were established: considerable surface activity,  
foam-forming ability, formation of highly dispersive foams stable at the  
juncture with gas condensate, inert to gas, noncorrosive to pipelines,  
biologically-degradable and domestically produced. On the basis of the  
properties studied (surface tension isotherms, initial coefficients of  
penetration and spreading, foam forming power, foam stability, etc.) the best  
results in cleaning the pipeline from gas condensate were obtained with alkyl  
(C<sub>10-13</sub>) sulfate solutions containing higher fatty alcohol additives and 1%  
solutions of C<sub>10-13</sub> sulfoethoxylates. Prevacel solutions were found to be  
unsuitable for this purpose. Figures 4; references 5: 4 Russian, 1 Western.

7813/13046  
CSO: 1841/479

UDC 662.749.2:622.781

USE OF PETROLEUM COKE SULFIDE IN CHEMICAL INDUSTRY

Moscow KHIMICHESKAYA PROMYSHLENNOST in Russian No 10, Oct 85 pp 616-617

[Article by V.Ya. Koshkarov, G.A. Trutnev, M.Ye. Koshkarova and F.D. Pushkarev]

[Abstract] The use of petroleum coke sulfide to replace metallurgical coke  
was studied. A method for obtaining petroleum coke sulfide was developed  
which involved lowering the reactivity of metallurgical coke through the  
replacement of low-sulfur, low-coke carbon by 5% high-sulfur petroleum coke

finer. This lowered the ash content, increased mechanical stability, decreased fines and reactivity, and raised the melting point. Optimal technical parameters for thermal briquetting of petroleum coke fines were developed. Heat of combustion was 35,948 kJ/kg for the petroleum coke briquettes, as compared to 28,000 kJ/kg for metallurgical coke. Limestone calcining, conducted using petroleum coke briquettes in the fuel mixture, resulted in high quality technological gases. A slight lowering of the fuel amount in the first stage of the furnace was necessary to keep the temperature within normal limits. The yield of incompletely-burned material in the third stage was increased, as was gas sulfur content. The results demonstrate the possibilities for using petroleum coke in the chemical industry. References 3 (Russian).

12126/13046  
CSO: 1841/228

UDC [661.183.123.002.614:622.323].003.1

#### ECONOMIC EFFECT OF USE OF SURFACE-ACTIVE SUBSTANCES IN PETROLEUM PRODUCTION

Moscow KHIMICHESKAYA PROMYSHLENNOST in Russian No 10, Oct 85 pp 631-633

[Article by L.P. Koval, Ye.A. Zeybart and G.A. Gurina]

[Abstract] Recent experience with the water injection method for extraction of petroleum from conventionally depleted fields has demonstrated that addition of nonionic surface-active substances to the water can substantially increase the yield. The effectiveness of this procedure is usually calculated by comparing the cost of the additive with that of the petroleum recovered. However, it is more appropriate to compare the total energy consumption of the processes of obtaining and using the surfactants with the energy content of the additional petroleum obtained. One ton of additive can increase yield by 40-110 tons of petroleum, representing 63-173 tons of ideal fuel. The total energy consumption for 12 surfactants was calculated; it varied from 4.5 to 7.1 tons of ideal fuel per ton of additive. The most economical additives were hydroxyethyl alkylphenols and hydroxyethyl fatty alcohols, obtained via the hydroformylation of n-olefins and hydrogenation of oxidized paraffin. To make the process more economical, energy expenditure during the production of the hydrocarbon starting materials must be reduced. The energy comparison indicates that use of surfactants is effective if 1 ton of additive increases petroleum production by 10 tons, while the cost comparison indicates that 40 tons of petroleum are required. The results confirm the utility of using surface active substances to increase petroleum production yields. Figures 1; references 4 (Russian).

12126/13046  
CSO: 1841/228

## PREPARATION OF ALKYL PHENOLS WITH ZEOLITE-CONTAINING ALUMINOSILICATE CATALYST

Baku AZERBAYDZHANSKOYE NEFTYANOYE KHOZYAYSTVO in Russian No 12, Dec 85  
pp 42-44

[Article by V.A. Soldatova and T.N. Shakhtakhtinskiy, ITPKhT [expansion unknown], Azerbaijan SSR Academy of Sciences (AS), V.S. Aliyev, Sh.G. Sadykhov and B.I. Pavlyuk, INKhP [expansion unknown], Azerbaijan SSR AS, A.I. Levin and S.Ya. Rykov, Angarsknefteorgsintez Production Association, and Yu.G. Lisenkov, All-Union Scientific Research Institute of Oil Refining]

[Abstract] Comparative studies were conducted on the preparation of alkyl phenols for use as oil additives by using zeolite-containing aluminosilicate catalyst and conventional KU 2-8 catalysts for the alkylation of phenol by polymeric distillate. Optimal conditions for the reaction catalyzed by zeolite-containing aluminosilicate were represented by a temperature of 130°C, a phenol:distillate molar ratio of 2:1, and a volumetric flow rate of the raw materials of 0.3 h<sup>-1</sup>. These conditions assured a phenol conversion rate of 75% and a 98% yield of the target product. Analysis of the alkyl phenol composition obtained on KU 2-8 catalysts and the zeolite-containing aluminosilicate showed excellent agreement for the phenol, o-alkyl phenol, p-alkyl phenol, and di-alkyl phenol components. Figures 2; references 7 (Russian).

12172/13046  
CSO: 1841/439

## DEVELOPMENT OF OIL AND GAS DRILLING INDUSTRY IN AZERBAIJAN SSR

Baku AZERBAYDZHANSKOYE NEFTYANOYE KHOZYAYSTVO in Russian No 12, Dec 85  
pp 49-52

[Article by M.A. Mamedov, Scientific Research Institute of Economics, Azerbaijan SSR State Plan]

[Abstract] A cursory survey was presented of the oil and gas drilling and exploratory activity in Azerbaijan in the last Five-Year Plan and the three years of the current Plan. Over the past 15 years, crude oil production has decreased 1.5-fold, although gas production increased about 2.5-fold. On balance, the production of hydrocarbons increased by 0.6% in comparison with 1970 due to the increase in gas recovery. The drop in oil production is largely due to negligence and nonadherence to the highest managerial and administrative standard, a situation reflected in poor drilling technology and exploratory studies. On the basis of the administrative and technical shortcomings, it has been anticipated that in the 12th Five-Year Plan oil production will decrease by 10.3% in comparison with the 1980 level. To

mitigate a further deterioration of the oil and gas industry in Azerbaijan, new methods and improvements must be developed and implemented in the recovery of petroleum, with studies showing that tertiary recovery methods can lead to extensive oil recovery from old fields, particularly in the Khorasany-Koshanaur, Binagadi-Kirmaku, Puta-Kushkhana-Umbaki regions and Artem Island.

12172/13046  
CSO: 1841/439

#### USSR INSTALLATION OF DUTCH-DEVELOPED PETROLEUM PIPE PLANT

Baku AZERBAYDZHANSKOYE NEFTYANOYE KHOZYAYSTVO in Russian No 12, Dec 85  
pp 55-56

[Article by V.T. Goltsov]

[Abstract] The collective of the Construction and Installation Administration of No 3 Trust of the Caspian Sea Oil and Gas Drilling Enterprise has installed an assembly for concrete-treating pipes 219 to 830 mm in diameter. The installation was purchased from the Dutch firm "Royal Boskales" [sic], with a production rate of 60 11.5 m-long pipes per shift. For the present, the pipes will find use in underwater pipelaying in connection with the April 28 drilling site in the Caspian Sea, where 27 km of pipeline has already been laid.

12172/13046  
CSO: 1841/439

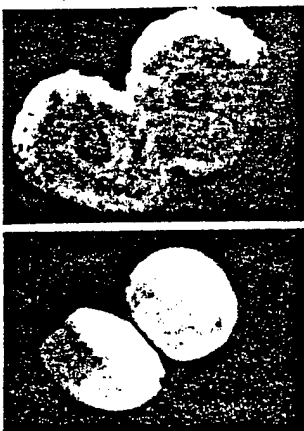
## POLYMERS AND POLYMERIZATION

### POLYMERS MADE TO ORDER

Moscow ZNANIYE-SILA in Russian No 3, Mar 86 p 7

[Text] In a chemical reactor, the synthesis of polymers usually proceeds so that the prepared material exits in a flourlike form. It is then necessary to turn it into granules. Granulation is very expensive.

Specialists at the Institute of Chemical Physics, Academy of Sciences, USSR, proposed a new technique for producing polymers in which the polymers are already synthesized into granules in the reactor. Now this technique has been patented in many countries--the USA, Japan, and the FRG. The basic idea is that, in the reactor, polymerization occurs on particle-carriers, and the polymer grows like a snowball by repeating the geometric form of the original particle. The most diverse materials can be used as carriers--they can be pellets of inorganic graphite or particles of any type of polymer. In recent work, scientists from IKhF (Institute of Chemical Physics) investigated how the form and dimensions of polymerized chunks of polyethylene and polypropylene depend on the physical characteristics of the carrier particles.



Microphotographs of polypropylene and polyethylene particles.

In the experiments, spherical styrene particles coated with a catalyst by a special technique were used. In other words, the surface of the carrier served as a substrate for the catalyst. It was possible to alter not only the dimensions of the carrier particles but also the character of their surfaces on a large scale. With such a method, the dimensions and form of the obtained granulated polymers were successfully altered.

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FLEXURE OF TWO-LAYER CONSTRUCTIONS CONSISTING OF EPOXIDE FIBERGLASS  
PREPARED BY COMPOSITE GALVANOPLASTIC METHOD

Vilnius TRUDY AKADEMII NAUK LITOVSKOY SSR: SERIYA B in Russian No 6,  
Nov-Dec 85 (manuscript received 24 Oct 84), p 123

[Article by R.A. Glyamzha and A.P. Mikalauskyte, Institute of Chemistry and  
Chemical Technology, LiSSR Academy of Sciences]

[Text] The conditions of preparing rigid-formed two-layer constructions  
containing fiberglass by the composite galvanoplastic method are investigated  
with the goal of applying them in assemblies of antenna-feeder devices. It  
is shown that the rigid-forming of constructions determines the regime of  
formation and properties of galvanoplastic and plastic layers. Recommenda-  
tions on conducting technical processes which will guarantee the production  
of constructions with minimum flexure are given.

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## NONFERROUS METAL REPLACEMENT BY REINFORCED POLYMER

Moscow ZNANIYE-SILA in Russian No 3, Mar 86 p 7

[Text] The State Institute for Planning of the Nonferrous Metallurgy Industry has developed an automated line for building equipment out of reinforced polymer concrete. It appears that the institute is planning something entirely out of character. But we remember that nonferrous metallurgy specialists are always concerned with saving on metal. The new line, which in principle is not really a line, is an entire factory which entirely eliminates the use of non-ferrous metals in a number of technical machines.

The factory prepares a binding polymer concrete composite from a furfuralacetone monomer and benzenesulfonic acid. And farther down the line, the techniques are similar to usual concrete factories: the binding polymers are mixed with concrete, formed, compacted with vibrations, and heat treated. For the most part, the total cleaning of exhaust gases and waste water involves toxic materials; however, regular concrete production is not totally clean either.

Here is only one example of polymer concrete application: Electrolytic tanks were always made with a protective coating of lead. Two thousand polymer concrete tanks have already been manufactured with a savings of 1,000 tons of lead.

Use of the most diverse equipment made of reinforced polymer concrete, operating in corrosive environments, allows a savings of 1.5 million rubles per year.

Reinforced polymer concrete does not corrode and is elastic. The combination of such valuable properties makes it indispensable for fencing-in fields of cattle-breeding farms.

Above all, at each cattle-breeding farm, 80-100 tons of cement are saved, and that is only at one particular establishment!

Polymer concrete is a very innovative material. It will find wide application in the agro-industrial complex for the construction of irrigation systems and for chemical apparatuses which operate in various corrosive environments.

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## ANTISTATIC POLYMERS FOR COMPUTER ROOM FLOORS, WORK CLOTHING

Moscow MOSKOVSKAYA PRAVDA in Russian 20 Feb 86 p 2

[Article by T. Shvedovskaya, candidate of technical sciences]

[Excerpt] There is a big need for antistatic polymers. They are useful in television and radio communications centers, medicine, instrument building and many other branches of the economy. Under the direction of Professor A.L. Bulachenko of the USSR Academy of Sciences' Institute of Chemical Physics and Docent O.N. Sheverdyayev of the All-Union Correspondence Polytechnical Institute, Moscow scientists are developing antistatic products on the basis of certain industrial polymers. Joint developments have linked these institutes for many years. And here are some of the results of their work.

Suppose that a computer center has a floor covering consisting of a single layer of dielectric linoleum. Irregularities will occur in the operation of computers because discharges of static electricity will take place in the remote operator all the time the computers are in operation. If there is a two-layer polyvinylchloride floor covering in the same computer center, there will be no irregularities in the operation of computers, because there will be no discharges at all. This material is indispensable in operating rooms and medical x-ray laboratories. Experimental-industrial lots of this product which have been produced are already in use.

Textile materials, even impregnated ones, cannot, unfortunately, be immune to petroleum products soaking into them when workers do their jobs on loading platforms of railroads or on tanker equipment, for example. Oil which gets on a person's skin can cause dermatitides and eczemas. The Moscow scientists have developed a textile material with a polymer coating, "elastoiskozha-T," which prevents such penetration of petroleum products. The danger of static-electricity discharges is reduced to zero as a result. This material retains its protective properties at temperatures from minus 60 to plus 50 degrees.

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UDC 541.64:678.01

CONTROL OF SPECIFIC SURFACE AREA OF POLYHEXAMETHYLENESEBACINAMIDE (PHMSA)  
COMPOSITES WITH METAL SILICATE FILLERS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 59, No 1, Jan 86  
(manuscript received 29 May 85) pp 225-226

[Article by D.A. Kabanov, O.V. Syrkova and V.K. Tsvetkov]

[Abstract] Nitrogen desorption studies at  $-196^{\circ}\text{C}$  were conducted on PHMSA composites to determine the effects of Mg and Cu silicate fillers on the specific surface area. Addition of ca. 1% filler increased the area from  $1.6 \text{ m}^2/\text{g}$  for the unfilled sample to  $20\text{--}25 \text{ m}^2/\text{g}$ , due to changes induced in the molecular structure of the polyamide. A further increase in the filler to 1.5 to 2% resulted in an increase in the surface area to ca.  $50 \text{ m}^2/\text{g}$ , with IR spectroscopy indicating that this marked change was due to formation of silicate structures within the composite. A drastic drop in the specific surface area seen when the concentration of the filler was increased to 3% was attributed to a decrease in the MW of the polyamide chains and their infiltration of the filler pores. These observations indicate the extent to which the specific surface area of composites can be regulated by filler addition for industrial purposes, and that such an approach is suitable for theoretical studies on structure formation in composites. Figures 3; references 5 (Russian).

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UDC 661.095.2/3:66.021.32

COMBINED PROCESS AND APPARATUS FOR SYNTHESIS OF HETEROCHAIN POLYMERS AND  
SHAPING OF POLYAMIDE FIBRIDS BY GAS-LIQUID POLYCONDENSATION

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 59, No 1, Jan 86  
(manuscript received 28 Dec 84) pp 145-149

[Article by V.A. Nikiforov]

[Abstract] A summary analysis is presented of the technical steps involved in the production of heterochain polymers and shaping of polyamide fibrids by gas-liquid polycondensation, along with tabulated physical data on 29 polyamide fibrids (e.g., viscosity, melting temperatures, zeta potential, sp. surface area, etc.). A schematic is provided for a cylindrical reactor used

for the combined process employed in synthesis of the heterochain polymer and the shaping of the fibrid. The process involves gas-liquid polycondensation in a highly turbulent hydrodynamic situation with the use of highly reactive monomers for polyamidation. Terephthalyl chloride or a mixture of terephthalyl chloride and isophthalyl chloride are used as the monomers for acylation in the preparation of fibrids with high thermal resistance, with ethylenediamine, hexamethylenediamine, xylylenediamine, piperazine, etc., as the monomers undergoing acylation. This approach allows the use of dichloroanhydrides of the lower carboxylic acids, the use of air or an inert gas as the carrier for the acylating agents, and water as the liquid phase. A recirculating system is employed for the liquid phase, while the gas phase is discharged into the atmosphere since it is free of toxic substances. Figures 1; references 13: 10 Russian, 3 Western.

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UDC 532.64:546.281.31

#### INVESTIGATION OF TEFLON WETTING MODIFIED WITH SYNTHETIC POLYELECTROLYTES

Moscow KOLLOIDNYY ZHURNAL in Russian Vol 48, No 1, Jan-Feb 86 (manuscript received 20 Jun 84) pp 176-180

[Article by K.I. Omarova, K.B. Musabekov, A.I. Izimov, A.L. Skachkova and G.K. Kendzhebayaeva, Kazakh University, Alma-Ata]

[Abstract] Effect of the volume, composition, and other properties of synthetic polyelectrolytes (SPE) on adsorption, wetting, and electrokinetic potential of teflon was studied using poly-2-methyl-5-vinylpiperidine, polyacrylic acid, and polymethacrylic acid. Study of the kinetics of wetting of the teflon surface with aqueous solutions of SPE showed that significant decrease of the contact angle occurs in the initial 20-30 minutes. Later, a steady state is reached. At low concentrations of SPE (up to  $10^{-2}\%$ ), teflon pretreated with aqueous solutions of SPE shows a drastic decrease of the contact angle in the first 3-5 minutes. The modifying effect of SPE is directly related to the molecular weight and hydrophobicity of the polymer chain. With greater than  $10^{-2}\%$  concentration of polyelectrolytes, the contact wetting angle of treated teflon was the same as that of the pure teflon. Figures 4; references 13: 8 Russian, 5 Western (2 by Russian authors).

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CSO: 1841/479

## POLYCONDENSATION OF BIOPOLYMER MACROMOLECULES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 12, Dec 85  
(manuscript received 7 May 84) pp 2611-2614

[Article by N.P. Kuznetsova and G.V. Samsonov, Institute of High Molecular Weight Compounds, USSR Academy of Sciences]

[Abstract] Bifunctional reagents can form intra- or intermolecular bonds with protein molecules depending on the general number of reactive amino acid residues present and their distribution on the protein surface. Human placental serum albumin was reacted with glutaric aldehyde, with the degree of reaction at a specific time determined by rapid ultrafiltration of part of the solution. Size distribution of the resulting oligomers was determined by gel chromatography, with the columns calibrated by using protein markers of known molecular weight. Molecular weight distributions were determined for various concentrations of albumin and various ratios of albumin to aldehyde. At low albumin concentrations, the aldehyde was largely expended on intramolecular bonds, with some intermolecular bridging forming tri- and tetraoligomers. Higher albumin concentrations increased the yield of oligomers, while higher aldehyde concentrations intensified the formation of intramolecular bonds. Within the range 5.7-8.0, changing pH only weakly influenced the reaction, with increasing pH slightly increasing the number of amino groups modified by the aldehyde as the likelihood of intramolecular bonding rose and the average molecular weight of the oligomer dropped by 10-20%. Apparently, the increase of negative charges on the albumin as it moved up from its isoelectric point at pH 5.0 increased mutual repulsion of the albumin globules and so intermolecular bonding became more difficult. Figures 2; references 13: 3 Russian, 10 Western.

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CSO: 1841/331

## REASONS FOR EXTREME CHANGES OF SURFACE AND ADHESIVE PROPERTIES OF POLYMER-POLYMER SYSTEMS AT DISSOCIATION

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 286, No 2, Jan 86 (manuscript received 12 Feb 85) pp 388-392

[Article by Yu.S. Lipatov, academician, UkSSR Academy of Sciences, Ye.V. Lebedev and T.N. Bazilyuk, Institute of the Chemistry of High Molecular Weight Compounds, UkSSR Academy of Sciences, Kiev]

[Abstract] This paper investigates the changes with concentration of the surface tension of the surface and bulk layers of polymer-polymer systems and the correlation of these changes with changes in adhesive strength. Eleven

pairs of industrial polymers, such as high-density polyethylene and shock-resistant polystyrene, were examined with up to 10% of one added to the other. Surface tension was measured on the surface and then in the bulk volume after shaving away 50% of the sample thickness. Adhesive strength was measured by peeling samples at a rate of 50 mm/min. For all the compositions, the surface tension at the surface showed a sharp increase in regions of low concentration of the polymer-additive. Systems with matrices of shock-resistant polystyrene and of a polystyrene-acrylonitrile copolymer showed a more complex dependence, probably due to the nonhomogeneous nature of the matrix itself. The changes were significant enough to indicate that they were not due to local solubilization alone. Analogous changes were noted in the surface tension in the bulk system, indicating the same driving force in both cases, specifically a change in the energy of cohesion. A table of the changes in surface tension and adhesive strength clearly indicates that polymers modified with small additions (1-4%) of another polymer exhibit maximum surface tension and correspondingly maximum adhesive strength. These effects are apparently due to structural changes leading to an increase in the cohesive strength of the matrix polymer and, consequently, to an increase of surface tension of the composition and adhesive strength in the contact zone of the polymer-substrate. These structural changes may be a result of a pretransitional state anticipating the dissociation of the polymer-polymer system into phases of the individual components. Kinetic limitations and the very low coefficients of diffusion of such systems form the conditions for the partial or total transport of the pretransitional anomalies into the solid aggregate state where phase division is almost completely restrained. Figures 2; references 15: 13 Russian, 2 Western.

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UDC 541.15:541.64:541.49:547.361:678.742

SYNTHESIS AND REACTIVITY OF METAL-CONTAINING MONOMERS. COMMUNICATION 2:  
RADIATION GRAFTING POLYMERIZATION OF COMPLEXED ALLYL ALCOHOL ON POLYETHYLENE

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 1,  
Jan 86 (manuscript received 3 Aug 84) pp 42-44

[Article by V.S. Savostyanov, A.D. Pomogaylo, D.A. Kritskaya and A.N. Ponomarov,  
Chernogolovka Branch of Institute of Chemical Physics, USSR Academy of Sciences]

[Abstract] Characteristics of postradiation liquid phase grafting polymerization of allyl alcohol (AA) on polyethylene powder were studied in the presence of Co(II), Ni(II), Cu(II), and Cr(III) salts. The polyethylene sample was irradiated at 20° in air prior to the grafting process. Spectra of CoCl<sub>2</sub> solutions in AA show an intensive band at 671 nm which indicated formation of tetrahedral complexes Co(AA)<sub>2</sub>C<sub>2</sub>. Co(NO<sub>3</sub>)<sub>2</sub>·6H<sub>2</sub>O solutions in AA show a band at 625 nm which is characteristic of an octahedral complex of Co(II). The copolymers of AA grafted in polyethylene in presence of CoCl<sub>2</sub> and Co(NO<sub>3</sub>)<sub>2</sub>·6H<sub>2</sub>O were colored blue and pink; possibly the structure of starting

complexes was retained. However, data on magnetic moments of Co(II) suggests that the tetrahedral orientation of Co(II) in monomeric state changed to octahedral in the polymer. The rate of AA grafting increased with increasing ratio of  $[\text{CoCl}_2]:[\text{AC}]$  up to 1:5 and then it stabilized. Effective energy of activation of the grafting process was 40 kJ/mole. Figures 2; references 11: 8 Russian, 3 Western (1 by Russian authors).

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UDC 541.15:541.64:541.49:547.361.678.742

SYNTHESIS AND REACTIVITY OF METAL-CONTAINING MONOMERS. COMMUNICATION 3:  
RADIATION GRAFTING POLYMERIZATION OF Co(II), Ni(II), AND Cu(II) ACRYLATES ON  
POLYETHYLENE

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 1,  
Jan 86 (manuscript received 3 Aug 84) pp 45-49

[Article by V.S. Savostyanov, A.D. Pomogaylo, D.A. Kritskaya and A.N. Ponomarev,  
Chernogolovka Branch of Institute of Chemical Physics, USSR Academy of Sciences]

[Abstract] Mechanism and kinetics of grafting polymerization of metal-containing monomers (MCM) with a  $\sigma$ -bond of the metal in the monomer, on  $\gamma$ -irradiated polyethylene powder were studied. Co(II), Ni(II), and Cu(II) acrylates were used as MCM. Grafted copolymers were obtained in all cases with an IR band at  $1636\text{ cm}^{-1}$  indicating presence of a free carboxyl group of the acrylic acid. The polymerization rate was greatest in the first 30 min of the reaction, the grafting rates of Co, Ni, and Cu acrylates were within 20% of each other. This polymerization was initiated by radicals formed from the breakdown of hydroperoxy groups followed by a predominantly bimolecular-break of the growing polymer chains in case of Co and Ni, and a monomolecular-break in case of Cu. Effective energy of activation of this process was 49, 55, and 42 kJ/mole for Co, Ni, and Cu acrylates, respectively. These polymerization rates did not change even with introduction of 2,2,6,6-tetramethyl-4-hydroxypiperidyl-oxyl--a strong inhibitor of radical reactions. Figures 3; references 10: 5 Russian, 5 Western.

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## RADIATION CHEMISTRY

### INSTITUTE DEVELOPMENTS FOR RADIATION TREATMENT OF MATERIALS

Riga SOVETSKAYA LATVIYA in Russian 18 Jan 86 p 1

[Article by K. Shvarts, corresponding member of the Latvian Academy of Sciences, head of a laboratory of the academy's Institute of Physics]

[Excerpt] Implementation of the program which the Soviet Union has proposed for the total elimination of nuclear weapons everywhere in the world would open up new horizons for introducing achievements of nuclear and radiation physics for peaceful purposes. Our Institute of Physics of the Latvian Academy of Sciences already has many years of experience with such constructive research. Tagged atoms which are used as a sensitive method of analysis are now serving medicine and biology. With the aid of radiation, new materials are being developed for semiconductor technology, for example.

An original device--a radiation circuit--is one of the recent developments of scientists of our institute. This circuit transforms the energy of neutrons into gamma rays, which are capable of working wonders. Concrete pipes which are impregnated with polymer solutions and irradiated acquire extra strength and durability.

In a few days we will send out notices regarding the next All-Union conference on questions of radiation physics and chemistry of crystals. This conference will take place in Riga in October of this year. It will be attended by scientists who for 40 years have been urging that nuclear energy be used solely for peaceful purposes.

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UDC 539.375.539.1

#### NUCLEAR REACTION POTENTIAL DURING DESTRUCTION OF SOLIDS

Moscow KOLLOIDNYY ZHURNAL in Russian Vol 48, No 1, Jan-Feb 86 (manuscript received 21 Oct 85) pp 12-14

[Article by B.V. Deryagin, V.A. Klyuyev, A.G. Lipson and Yu.P. Toporov, Institute of Physical Chemistry, USSR Academy of Sciences, Moscow]

[Abstract] Experimental data were reported on an attempt to register neutron radiation during impact destruction of heavy ice  $D_2O$ . It was shown that the neutron count obtained during destruction of frozen  $D_2O$  was higher than in the case of an  $H_2O$  target. Thus, it was shown that weak neutron streams may be seen during shock-destruction of deuterium-containing solids indicating that nuclear DD-reactions could occur in the destruction zone. Figures 1; references 10: 8 Russian, 2 Western.

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UDC 541.14:547.816

#### LASER PULSE PHOTOLYSIS OF SPIROPYRANS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 12, Dec 85 (manuscript received 5 Jun 84) pp 2698-2703

[Article by L.S. Atabekyan and A.K. Chibisov, Institute of Geochemistry and Analytic Chemistry imeni V.I. Vernadskiy, USSR Academy of Sciences, Moscow]

[Abstract] The absorption spectra of intermediate compounds and the kinetics of their transformation were registered with the use of both a neodymium laser providing 10 ns pulses at a wavelength of 354 nm and energy level of 0.5 mJ and a synchronized short-interval (500  $\mu$ s) lamp. Spectral changes were registered with a grating monochromator, a photoelectron multiplier, and a memory oscillograph. Three spiropyrans from the indoline series were subjected to photolysis in the presence of nitric, hydrochloric, and sulfuric acids at concentrations of  $10^{-6}$ - $10^{-2}$  mol/l at approximately 20°C. Ultraviolet irradiation resulted in the formation of merocyanine forms in two consecutive stages, rapid (10 ns) and slow (500 ns). Spectral observations indicate that

formation of the relatively stable merocyanine form is preceded by the formation of a very short-lived (2 ns) cis-isomer and several unstable trans-isomers with similar spectra. In the presence of acid, the yield of the most stable trans-isomer decreased, apparently due to competitive protonation with its predecessor isomer and even with the predecessor once removed in more highly acidic solutions. Figures 6; references 13: 10 Russian, 3 Western.

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CSO: 1841/354

UDC 541.15

#### SUNSPOT NUMBER-RELATED FLUCTUATIONS IN GAS YIELD ON WATER RADIOLYSIS

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 60, No 1, Jan 86 (manuscript received 15 Feb 84) pp 187-191

[Article by M.Ye. Yeroshov (deceased) and A.V. Sheynina]

[Abstract] Long-term (1972-1981) studies were conducted on gas production from gamma-irradiation of water in an open system, using a barometric manometer-type apparatus made from 1Kh19N9T steel. Using Co-60 as a source, gas production was found to vary with the season of the year, month, and day by as much as 50%. A positive correlation ( $r = 0.52$ ,  $p = 0.001$ ) was found to prevail between the relative sunspot number and gas production, indicating sun-related changes in water properties. In addition, further confirmation for the change in the properties of water was provided by fluctuations in the composition of the gas, including the detection of nitrogen. Generally, highest concentrations of nitrogen were detected in April and August, demonstrating thereby changes in the solvent properties of water for nitrogen. Figures 5; references 13 (Russian).

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UDC 542.61

#### EXTRACTION METHODS FOR ISOLATION, PURIFICATION AND SEPARATION OF TRANSPLUTONIUM ELEMENTS

Leningrad RADIOKHIMIYA in Russian Vol 28, No 1, Jan-Feb 86 (manuscript received 1 Dec 83) pp 99-106

[Article by V.M. Nikolayev, B.F. Myasoyedov, Ye.A. Filippov, V.V. Yakshin, V.T. Filimonov and B.N. Laskorin]

[Abstract] Three main tasks exist in isolation of transplutonium elements (TPE): their separation from acid solutions which could contain considerable concentrations of multivalent ionic salts, purification of TPE from admixtures

of rare earth elements (REE) and separation of individual TPE from each other. Comparison of mono- and bifunctional phosphorus-containing extracting agents showed that the most suitable are the dioctylisoamylphosphine oxide (DOIAPPO) type reagents. Other extracting agents discussed in this paper are: diphenyl-[dibutylcarbamoylmethyl]phosphine oxide, 1-phenyl-3-methyl-4-nitropyrrolone-5 mixed with sulfoxides and a number of solvent mixtures. Separation coefficients for various combinations of elements were reported for a TPE-REE system and for endo-TPE situations. It was concluded that, thus far, there are no good solvents for these processes except those that require a complex-forming step. Figures 9; references 22: 16 Russian, 6 Western (2 by Russian authors).

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UDC 546.799.4:577.391

#### CURRENT PROBLEMS IN RADIOBIOLOGY OF TRANSPLUTONIUM ELEMENTS

Leningrad RADIOKHIMIYA in Russian Vol 28, No 1, Jan-Feb 86 (manuscript received 1 Dec 83) pp 118-124

[Article by Yu.I. Moskaev and G.A. Zalikin]

[Abstract] Discovery and production of transplutonium elements (TP) is one of the great scientific achievements as these elements had disappeared from our environment due to natural decay. Developments in nuclear industry and in atomic energy created a new problem of contaminating our environment with TP group breakdown elements:  $^{241}\text{Am}$ ,  $^{244}\text{Cm}$ ,  $^{249}\text{Bk}$ , and  $^{252}\text{Cf}$ . Migration of these elements in the biosphere has not been adequately studied:  $^{239}\text{Pu}$  precipitates in an insoluble form on sea and land surfaces. Very little of this agent enters the food chain. For humans the most important entry point is through the respiratory system. Another important source is absorption from the GI tract, especially in combination with various complexing agents. Experimental data indicated that principal deposition organs for TP radioelements are the skeleton and liver and are closely related to the physical-chemical properties of the compounds and the animal's age. Excretion is slow, principally with urine and feces. Incorporation of these elements may lead to development of pneumosclerosis, cirrhosis of the liver, nephrosclerosis, lung cancer, and osteosarcomas. References 8: 5 Russian, 3 Western.

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## ADSORPTION AND MIGRATION OF TRANSPLUTONIUM ELEMENTS IN ENVIRONMENTAL SYSTEMS

Leningrad RADIOKHIMIYA in Russian Vol 28, No 1, Jan-Feb 86 (manuscript received 8 Feb 85) pp 124-129

[Article by V.D. Balukova, Ye.P. Kaymin and S.I. Ushakov]

[Abstract] Behavior of long decay-time transuranium and transplutonium elements in natural systems was addressed. The most dangerous among them are <sup>238</sup>Np, <sup>241</sup>Am, <sup>243</sup>Am, <sup>244</sup>Am, <sup>245</sup>Am, <sup>246</sup>Am, <sup>239</sup>Cm, and <sup>240</sup>Cm, <sup>242</sup>Pu, <sup>244</sup>Pu. Their transportation through natural deposits is tightly connected with ground-water movements. The principal parameters determining behavior of these radionuclides in ground formations are coefficients of isotope distribution between various phases, adsorption capacities of component minerals, effective porosity, filtration coefficients of the liquid, etc. These data are presented in tabular and graphic forms. In carbonate-bicarbonate groundwaters containing silicate minerals, the content of radionuclides could be quickly decreased by hydrolysis and formation of insoluble precipitates. Figures 3; references 2: 1 Russian, 1 Western.

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## BURIAL OF RADIOACTIVE WASTES CONTAINING TPE

Leningrad RADIOKHIMIYA in Russian Vol 28, No 1, Jan-Feb 86 (manuscript received 1 Dec 83) pp 134-141

[Article by R.V. Bryzgalova, A.S. Krivokhatskiy, Yu.M. Rogozin and G.S. Sinitsyna]

[Abstract] Burial of radioactive wastes containing transplutonium elements (TPE) was discussed; by some estimates, about 27 tons of TPE will be generated by the year 2000, 25% of which will consist of isotopes with long decay-time. The most promising disposal methods are based on the burial of such wastes in deep geological formations. Analysis of the storage conditions of solidifying highly active wastes, filtration and adsorption characteristics of the rocks, migration of radionuclides with proper consideration of the retention by these rocks led to conclusion that such wastes could be effectively stored in nonpermeable geological formations with maximal shielding power. Such storage sites can be found in rock salt mines. Figures 4; references 23: 12 Russian (2 by Western authors), 11 Western.

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## CHANGE IN ELECTRIC PROPERTIES OF ANTHRACITE DUE TO INFLUENCE OF PULSED LASER RADIATION

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 1, Jan-Feb 86 (manuscript received 8 Jul 85) pp 96-97

[Article by A.B. Pavlinov, A.V. Vannikov, T.S. Zhuravleva and V.Ya. Posylnyy, Shakhtinsk Branch of Novocherkassk Polytechnical Institute; Institute of Electrochemistry, USSR Academy of Sciences]

[Abstract] Laser radiation may lead to changes of physical-chemical properties of organic semiconductors. Effect of pulsed laser radiation on highly metamorphized anthracites was studied; this process led to generation of a positive temperature coefficient of resistance which made it possible to determine photogeneration in illuminated samples when the resistance dropped upon exposure to the laser beam. In these experiments, the energy of the laser pulse was about 0.1 J, the wavelength 530 nm, duration of exposure 10 ms, and sample thickness about 100  $\mu\text{m}$ . It was shown that exposure to laser radiation resulted in increased photosensitivity and a change in the temperature coefficient of the resistance sign from negative to positive; the photogeneration and thermogeneration processes were clearly separated. Figures 1; references: 1 (Russian).

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UDC 541.183.5:678.046

ADSORPTION LAYERS IN RUBBER SOLUTIONS CONTAINING HOLLOW MICROSPHERES

Moscow KOLLOIDNYY ZHURNAL in Russian Vol 48, No 1, Jan-Feb 86 (manuscript received 20 Dec 84) pp 145-148

[Article by S.A. Gerasimov, I.A. Tutorskiy and V.Ya. Kiselev, Moscow Institute of Fine Chemical Technology imeni M.V. Lomonosov]

[Abstract] Effect of the nature of rubber, solvent, and the filler surface on reverse sedimentation rate of hollow spherical fillers in rubber solutions was studied. The microspheres were made of glass and phenol-formaldehyde resin (PFR). The results showed that the microsphere stability is a function of rubber and solvent, of the formation of associates in rubber solution, nature of the surface of fillers, and the structure of adsorption layer. Highly energetic glass surface formed a thin and "hard" layer of nitrile rubber in chloroform, while in concentrated solution, the stability of glass spheres was low. A high density absorption layer was formed on the surface of PFR microspheres in polar rubber solutions leading to greater stability of the dispersed system. Nonpolar rubbers in toluene formed a thick and "loose" hydrodynamic layer on the glass surface saturated with the sorbent which slowed down movement of microspheres. Adsorption of toluene on the PFR microsphere surface forms an interphase from the solvent between the particle surface and polymer solution which favors a high reverse sedimentation rate on these particles in rubber solutions. Figures 2; references 8: 7 Russian, 1 Western.

7813/13046  
CSO: 1841/479

UDC [661.7:547.322.34].002.237

INTENSIFICATION OF PROCESS FOR OBTAINING CHLOROPRENE

Moscow KHIMICHESKAYA PROMYSHLENNOST in Russian No 10, Oct 85 pp 590-592

[Article by V.A. Revyakin, S.V. Levanova, R.M. Rodova, G.T. Martirosyan, G.S. Grigoryan, E.M. Asatryan and A.Ts. Malkhasyan]

[Abstract] A study was conducted of the kinetics and yield of 3,4-dichlorobut-1-ene dehydrochlorination using sodium hydroxide, with or without phase

transfer catalysts. Reaction mixtures were analyzed by gas chromatography. Without catalyst, chloroprene was the exclusive product, with side products totaling not more than 0.1%. Yield increased with temperature, particularly above 60°. When yield was studied as a function of NaOH concentration over the range of 1.1-9.8 mole/l, the maximum yield was at 2-4 moles/l at all temperatures from 40 to 70°C. The NaOH concentration was directly proportional to the negative log of the rate constant, in accord with a second-order E2 mechanism. In the presence of 0.005-0.25% (C<sub>10</sub>-C<sub>16</sub> alkyl)hydroxyethylbenzylammonium chloride catalyst, the yield of chloroprene increased with increasing base concentration, while the rate constant went through a minimum at 2-4 moles NaOH/l. This indicates a change in reaction mechanism. The activation energy of catalytic dehydrochlorination was 17.2 kJ/mole at 0.5 moles NaOH/l and 11 kJ/mole at 9.8 moles NaOH/l. At 95° with 10% (3.5 moles/l) NaOH, 99% conversion was obtained with and without catalyst. Selectivity was 96.9% with catalyst and 93.4% without; organic impurities in the waste water were 0.105% and 0.130%, respectively. These optimal conditions should be used in industrial reactors. Figures 3; references 6: 2 Russian, 4 Western.

12126/13046  
CSO: 1841/228



## WATER TREATMENT

### PURIFIED DRINKING WATER AND QUACK HEALERS

Riga NAUKA I TEKHNIKA in Russian No 12, Dec 85 pp 26-27

[Article by V.A. Grinberg and A.M. Skundina, candidates of chemical sciences, reprinted from Khimiya i Zhizn, No 7, 1985]

[Abstract] Considerable attention has recently been focused on the alleged cure-all properties of water subjected to electrolysis or electrodialysis. While water so processed has many uses in industry and to some extent in biology and medicine, its pre-eminence as a panacea is touted by various quacks. A discussion is presented of some of the fundamentals of electrochemistry and electrode processes involved in the separation of the ionic components of water, with the notation that the various products and their concentrations are being evaluated by competent medical scientists vis-a-vis clinical usefulness. However, the threat to public health comes from quacks and their use of the 'magical' water since it may lead to neglect of medical conditions that require medical management.

12172/13046

CSO: 1841/417

AUTOMATED SYSTEM TO REPORT DOWNTIMES OF BASIC TECHNOLOGICAL EQUIPMENT

Moscow MIKROBIOLOGICHESKAYA PROMYSHLENNOST: EKSPRESS-INFORMATSIYA in Russian  
No 3, Mar 85, pp 3-4

[Article by G.S. Vershinina and V.V. Sukhanov, NTRS "Cellulose, Paper and  
Cardboard" 1984, No 4, p 9, (VNINIEIlesprom)]

[Text] There was developed and introduced, at Archangelsk TsBK, a system which makes it possible to provide subscribers with operational information about downtimes of all basic technological equipment which makes up operations of the enterprise as a whole and to produce, on the basis of data obtained, analyses of downtimes of specific operations due to different causes, to reduce time required to obtain such information, to increase the reliability of the information and to produce financial documents concerning downtimes for months, quarters and years.

The system is based on a UVK CM-2.

The system provides the following:  
daily input of digital information about the duration and causes of downtime for the past day on a DM-2000 screen;  
control of input data;  
storage of input data in the data base on magnetic disks;  
data storage on a magnetic tape;  
control of storage of accumulated data;  
possibility of correcting accumulated data;  
processing of accumulated data and formulation of reports of equipment downtimes for the past day and also for any longer period of time.

The data base created contains information about any downtimes of any technological equipment with indication of causes and duration of downtime for each cause for each day.

A DZM-180 memory and a color graphic TsGT terminal are used for data retrieval.

Daily, upon completion of input of daily data, there is a daily print-out of equipment downtimes. In addition to this, there are, upon request, print-outs for any time intervals with data summarized for groups of causes of downtime or with an excerpt for specific causes for any equipment. Before introduction of this system, 4-5 hours were required to calculate weekly

downtime of basic equipment. With use of the UVK, the same kind of report can be produced in only 20 minutes.

Data output from the TsGT is in the form of a graph-histogram. Program software is developed and output in a disk operational system of an aggregate system of program software (DOS ASPO) in the FORTRAN language with use of a system of control of files.

The system has been in commercial use for 3 years.

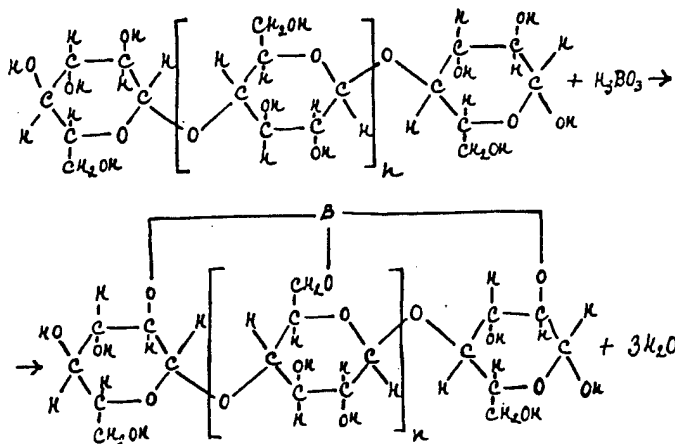
2791

CS0: 1841/150

## CROSS-LINKED PAPER

Moscow KHIMIYA I ZHIZN in Russian No 12, Dec 85 p 22

[Text] One hundred years ago, P.N. Yablochkov first used very fine paper treated with paraffin as a condenser dielectric. For many years, such a dielectric material was unrivaled, but, recently, synthetic polymer films have surpassed it. However, there is reason to believe that paper will regain the upper hand in this sphere once more. Specialists at the Malinskaya Paper Mill imeni Fifty Years of the Great October Socialist Revolution and the Ukrainian Scientific-Production Association of the Cellulose-Paper Industry found a way to markedly improve the dielectric properties of insulating paper. It consists of soaking the paper fabric in a boric acid solution.



The reaction of boric acid with cellulose during boration of condenser paper.

Paper consists of cellulose fibers whose chemical activity stems from hydroxyl groups. Boric acid, a weak acid, does not break the chain of cellulose macromolecules but substitutes the hydroxyl hydrogens with boron,

forming a stable compound--a boric acid ester. Because trivalent boron reacts with three hydroxyl groups, the formation of the ester is accompanied by a cross-linking of the material's molecular structure. Since rigidity of the molecular framework is characteristic for a cross-linked structure, it follows that its elements would have low mobility in an electric field. From this, high electrical resistance (ten times greater than in untreated cellulose) and low dielectric leakage result.

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/13046

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UDC 661.728:546.174

PHYSICOMECHANICAL CHARACTERISTICS OF CELLULOSE OXIDIZED BY NITROGEN (IV)  
OXIDE

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 59, No 1, Jan 86  
(manuscript received 6 Feb 84) pp 153-157

[Article by N.G. Tsygankova, F.N. Kaputskiy, D.D. Grinshpan and  
S.Ye. Makarevich]

[Abstract] A study was conducted on the physicommechanical changes induced in cellulose following oxidation by nitrogen (IV) oxide, in order to define factors that may be useful in the design of products based on modified cellulose. The study was conducted with chromatographic paper FN-15 (East Germany) subjected to oxidation for 1 to 24 h either with 25 or 50%  $N_2O_4$ . Tabulated analytical data (COOH group concentration, swelling in water, solubility in dimethylformamide- $N_2O_4$  mixture, density, etc.) indicated that the strength of modified cellulose is predicated, in the main, on two competitive processes when subjected to oxidation by  $N_2O_4$ : destruction and cross-linking. Enhanced carboxylation of the cellulose in combination with intensive cross-linking resulted in oxidized cellulose products with improved mechanical characteristics. Such processes were favored by an increase in the water content of the starting material and segmental mobility of the macromolecule, which were correlated with the initial degree of disorder in the structure. Figures 4; references 18: 16 Russian, 2 Western.

12172/13046  
CSO: 1841/450

## CHEMILUMINESCENCE OF PINE LIGNIN OXIDATION BY HYDROGEN PEROXIDE IN NaOH

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 59, No 1, Jan 86  
(manuscript received 1983; in final form 14 Jun 85) pp 219-222

[Article by O.P. Kozmina, T.P. Laskeyeva, A.Ye. Pravdolyubov and  
R.F. Vsilyev, Leningrad State University imeni A.A. Zhdanov; All-Union  
Scientific Production Association of the Cellulose-Paper Industry]

[Abstract] A study was conducted on the temporal characteristics of chemiluminescence attendant to the oxidation of pine lignin by hydrogen peroxide in NaOH at 95°C and pH 12, and at 70°C and pH 10.5. Analysis of the chemiluminescence curves demonstrated that they were entirely related to oxygen utilization and dependent on the presence of hydrogen peroxide. Addition of sodium silicate (a stabilizer of hydrogen peroxide) stabilized both the concentration of hydrogen peroxide and chemiluminescence, with only the configuration of the latter showing a change. These observations indicate that automated chemiluminescence detection can be employed to monitor the course of delignization, rather than intermittent chemical or spectrophotometric analysis. The  $I/I_{\max}$  ratio at the conclusion of bleaching is equal to 0.05. Figures 3; references 8: 4 Russian, 4 Western.

12172/13046  
CSO: 1841/450

UDC 547.992.3:535.379

## CHEMILUMINESCENCE ATTENDANT TO OXIDATION OF MODEL LIGNIN COMPOUNDS BY HYDROGEN PEROXIDE AND OXYGEN IN ALKALINE SOLUTIONS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 58, No 12, Dec 85  
(manuscript received 25 Apr 81; in final form 12 June 85) pp 2744-2747

[Article by O.P. Kozmina, A.Ye. Pravdolyubov and R.F. Vasilyev]

[Abstract] A study was conducted on chemiluminescence in the 300-600 nm band during oxidation of guaiacyl-derivatized lignin components by hydrogen peroxide and oxygen in alkaline solutions, to provide a more definitive description of chemiluminescence evident in delignization of woody plant tissues. With both hydrogen peroxide and oxygen, hydroperoxide groups are formed in the propane chain and phenol ring as the initial oxidation products, followed by rupture of their labile O-O bonds. The energy release in going from an intermediate product in an excited electronic state to a carbonyl product is accompanied by photon emission, accounting for the chemiluminescence detected in the oxidation of lignin compounds. Figures 1; references 13: 12 Russian, 1 Western.

12172/13046  
CSO: 1841/411

## MISCELLANEOUS

### WORK ON MAGNETIC EFFECTS IN CHEMICAL REACTIONS ENDORSED FOR PRIZE

Moscow PRAVDA in Russian 18 Mar 86 p 3

[Article by M. Kabachnik, academician, Hero of Socialist Labor]

[Excerpt] Even weak magnetic fields with an intensity of 100-1,000 oersteds produce a strong effect on chemical reactions in solutions and molecular solids. Soviet scientists' discovery of this effect was completely unexpected.

This discovery was registered by the USSR State Committee on Inventions and Discoveries.

It was subsequently demonstrated that chemical reactions are affected not only by an external magnetic field but also by internal fields generated by nuclei of reacting particles, if these nuclei possess a magnetic moment. This new phenomenon was named the magnetic isotope effect and registered by the USSR State Committee on Inventions and Discoveries.

The Soviet scientists are credited with resolving a paradox: weak magnetic influences whose energy is insignificant produce a powerful effect on chemical reactions, changing the spins of the reacting radicals and eliminating spin exclusions. This reveals new methods for controlling chemical reactions which are of a spin nature rather than an energy nature.

The discovery of the new effects also has important consequences for the related sciences of geochemistry and space chemistry, and it indicates ways of solving problems of the origin and chemical evolution of natural bodies: ores, minerals, oil, meteorites, etc.

Radical chemical reactions' property of generating a radio-frequency electromagnetic field, which the Soviet scientists discovered, is another important consequence of the isotope effect. In certain conditions, this reaction behaves like a molecular quantum generator, or maser.

The discovery of a 'maser' effect in chemical reactions provides a basis for development of new instruments and equipment in magnetometry. A mock-up of one such instrument is already in operation.



The Soviet scientists Yu. Molin, A. Buchachenko, R. Sagdeyev, K. Salikhov and Ye. Frankevich have been nominated for the Lenin Prize for their work-cycle, "Magnetic and Spin Effects in Chemical Reactions." The discovery of these new phenomena has revealed that magnetic effects play a basic role in chemistry and has given rise to the field of spin chemistry.

FTD/SNAP

/13046

CSO: 1841/500

## FORMATION OF DIAMONDS

Moscow ZNANIYE-SILA in Russian No 12, Dec 85 p 23

[Abstract] More than 10 years ago, E.M. Galimova of the Institute of Geochemistry and Analytic Chemistry imeni V.I. Vernadskiy proposed that diamonds crystallize in kimberlite because of cavitation. Sharp drops in the pressure of molten streams of rock can form not only low-pressure regions, but even voids. This is particularly likely to occur in liquids containing gas and solid particles serving as cavitation nuclei. Kimberlite has two peculiarities--it is often diamond-bearing and it typically contains cavities. Coalescence of these cavities can produce shock waves, subjecting contained gas to sudden peak pressures on the order of 1000 kilobar. If the gas is carbon-containing, diamond crystallites can form. Cavities in kimberlite magma are often saturated with methane. This dissociates into carbon and hydrogen at the high temperatures and pressures found within the cavities. When these cavities coalesce, the carbon crystallizes into diamond and the hydrogen escapes. Recrystallization then results in amalgamation of crystallites into larger crystals. This hypothesis is supported by new data which indicates that the carbon-13 to carbon-12 isotope ratio is not as uniform as once thought. This indicates that diamonds may be formed over a range of depths, rather than all at the great depths at which their formation had previously been attributed.

12672/13046

CSO: 1841/357

SELECTIVE REPLACEMENT OF HYDROGEN ATOMS BY FLUORINE ATOMS IN o-, m-CARBORANES  
BY REACTION WITH  $\text{SbF}_5(\text{C}_2\text{F}_5)_3\text{N}$  SYSTEM

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 1,  
Jan 86 (manuscript received 14 Oct 85) pp 253-254

[Article by V.N. Lebedev and L.I. Zakharkin, Institute of Heteroorganic  
Compounds imeni A.N. Nesmeyanov, USSR Academy of Sciences, Moscow]

[Abstract] A method was described for selective replacement of hydrogen atoms with fluorine in o- and m-carboranes by reacting them with an  $\text{SbF}-(\text{C}_2\text{F}_5)_3\text{N}$  system. In the case of o-carborane, the reaction gradually yielded 9,12-difluoro-o-carborane (I), 8,9,12-trifluoro-o-carborane (II), and 8,9,10,12-tetrafluoro-o-carborane (III); with m-carborane the product was 9,10-difluorocarborane (IV). The reaction occurred at 30-79°; the yield and m.p. being reported: I--80%, 321-322; II--62%, 313°; III--65%, 332°, and IV--65%, 293-294°C. References 5: 3 Russian, 2 Western.

7813/13046  
CSO: 1841/434

AUTOMOBILE BODY CARE

Riga NAUKA I TEKHNIKA in Russian No 12, Dec 85 pp 24-25

[Article by Yanis Brass, engineer-mechanic, and Yuris Pommers, candidate of technical sciences]

[Abstract] Coverage is given to the importance of car body care as a method of prolonging useful life and as a cost-effective practice. Various products are mentioned for grease and tar removal, waxes and other polishing agent, and the cleaning and care of chrome. Rudimentary coverage is also accorded to rust prevention and removal and minor paint repairs. Finally, the importance of cleanliness both inside the car and outside is stressed, as well as the fact that regular attention to such details results in an annual savings of 120-150 rubles per year per car for the owner.

12172/13046  
CSO: 1841/417

UKSSR ACADEMY OF SCIENCES CHEMISTS AND SCIENTIFIC TECHNOLOGICAL PROGRESS

Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 52, No 1, Jan 86 pp 3-6  
Editorial

[Abstract] This is a success story about Ukrainian chemists during the 11th Five-Year Plan. New free radical reactions were studied leading to development of novel high voltage sources of chemical and photochemical nature. New catalysts were developed as well as new polymethine dyes with deep colors; new chemistry of phosphorus at a lower coordination state was investigated. Extensive work was done in the area of macrocyclic crown-type compounds, cryptands, and their analogues. Advances were made in chemical current sources and energy conversion equipment. New analytical methods were introduced and new purification techniques for natural and effluent waters. One hundred ten monographs were published on a wide variety of topics. By improving the planning of work, economic savings were achieved amounting to millions of rubles. Work in the area of nutrition concentrated on improvement of agricultural applications. Considerable cooperation was developed with several ministries. Some shortcomings were noted in the areas of catalysis, high energy chemistry, and regeneration/recycling of chemicals, as well as in inadequate use of chemicals in agriculture.

7813/13046

CSO: 1841/436

- END -